

AUGUST 1944 - FIFTIETH YEAR

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AN ANNUAL AIRCRAFT PRODUCTION NUMBER



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OPERATION OF METAL-  
WORKING AND ALLIED  
EQUIPMENT

# MACHINERY

AUGUST, 1944

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Fifty years of publishing service to the mechanical industries have been completed with this number of MACHINERY, the first issue having been published in September, 1894. Our Fiftieth Anniversary will be commemorated in the September, 1944, number with a special editorial insert.

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The photograph on the opening page of the Aircraft Production Section of this issue was obtained through the courtesy of the Lockheed Aircraft Corporation.

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**Write for Bulletin E-93**

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July MACHINERY described manufacturing operations in plane factories that helped to turn out the amazing total of 175,000 fighting and bombing aircraft within three years. The present issue contains articles from some of the factories that built the engines, propellers, and instruments for driving and guiding our huge air fleets to their victorious goals.

## MACHINERY

Vol. 50 No. 12  
AUGUST, 1944



# **WRIGHT AERO PRODUCES**



The World's Mightiest Bombers Carry Heavier Bomb Loads Greater Distances, at Higher Altitudes and Faster Speeds, than Any Other Plane. They are Driven by 2200-Horsepower Engines Built by Modern Manufacturing Methods, of which a Few are Described Here

By K. E. SUTTON, Manager  
Wood-Ridge Plant, Wright Aeronautical Corporation

# ENGINES FOR THE B-29 SUPERFORTRESSES

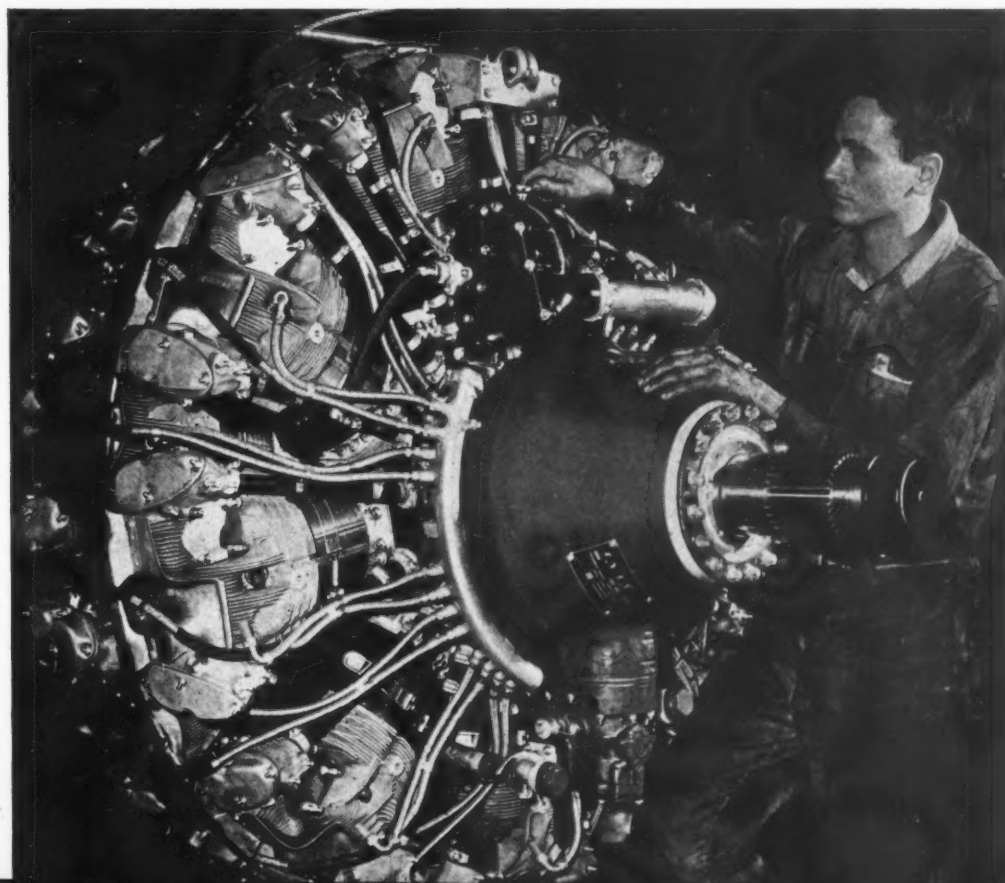
**B**EFORE the year 1944 reaches its end, the skies over enemy lands will be clouded by squadrons of Boeing B-29 Superfortresses, whose performance will surpass the spectacular records established by our Flying Fortresses. Japan has already felt the might of these great planes, which are capable of carrying the heaviest bomb loads higher, faster, and farther than any other plane in the world.

The Superfortress is driven by four Wright radial air-cooled engines of 2200 H.P. each, which have eighteen cylinders arranged in two banks of nine. The same engines drive the Martin Mars and the Lockheed Constellation. These Cyclone-18 engines are the most powerful of their type in production today. Despite their power, they have a maximum diameter of only 55 inches, which is the same as that of the original Cyclone nine-cylinder engine introduced in 1927, which had a rating of only 525 H.P.

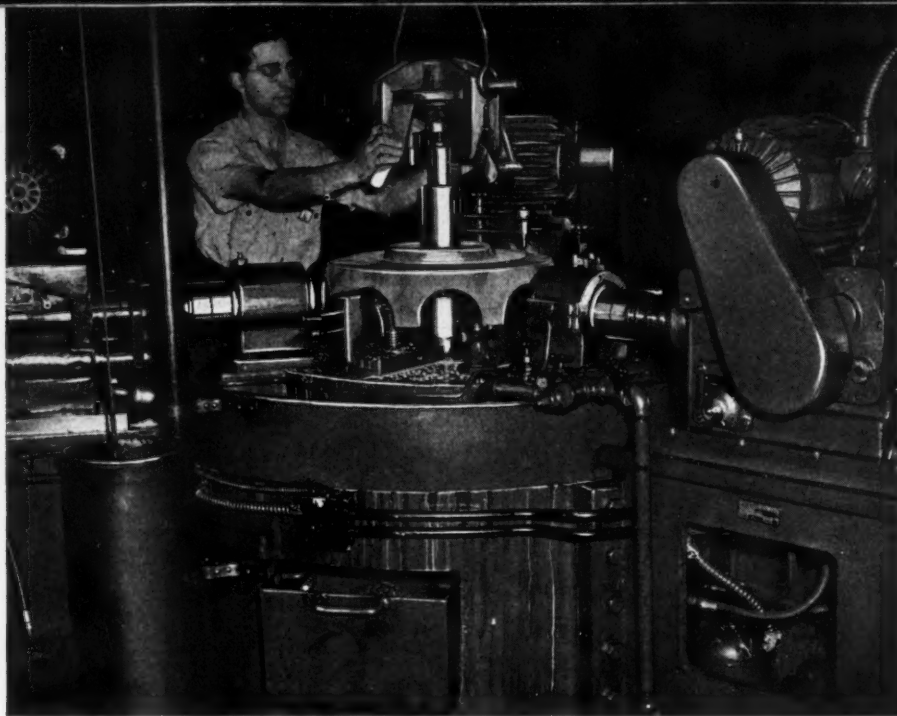
A brand new plant was built by the Wright Aeronautical Corporation specifically for producing these powerful Cyclone-18 engines and for machining the crankcases of Cyclone-9 engines, which are somewhat similar in construction to the Cyclone-18 crankcases, except, of course, that

they are designed with only one row of cylinders. This factory was planned on the basis of the experience gained by Wright Aero engineers during almost four years of quantity production for war purposes. Seldom have production engineers had such an opportunity to start from scratch without the necessity of utilizing some existing equipment and converting other units to the new job. The entire tooling and lay-out of this plant reflect the thought being given to the application of high-speed automatic equipment for the production of America's most important weapon—air power; the type of thinking that must necessarily continue into the post-war era when minutes saved will mean merely dollars and not the lives of fighting men.

The steel crankcase forgings for Cyclone-9 engines are first handled by the Snyder three-spindle machine shown in Fig. 1, which establishes three locating spots for the rough-turning operation. Each crankcase forging is loaded over a central post on the machine, and supported by three rest buttons, which are free to float up and down and are connected by short lever arms to flush-pin gages. Sliding blocks are then brought to bear against the inside contour of the crank-







**Fig. 1. (Left) Three Locating Spots are Bored in the Cylinder Openings of Crankcase Forgings in a Three-spindle Machine Equipped with Target Gages, Indicators, and Equalizing Blocks**

**Fig. 2. (Below) Largest Bullard Mult-Au-Matic so Far Built, which is Employed for Rough- and Semi-finish-machining the Outside Surfaces of Steel Crankcase Sections**

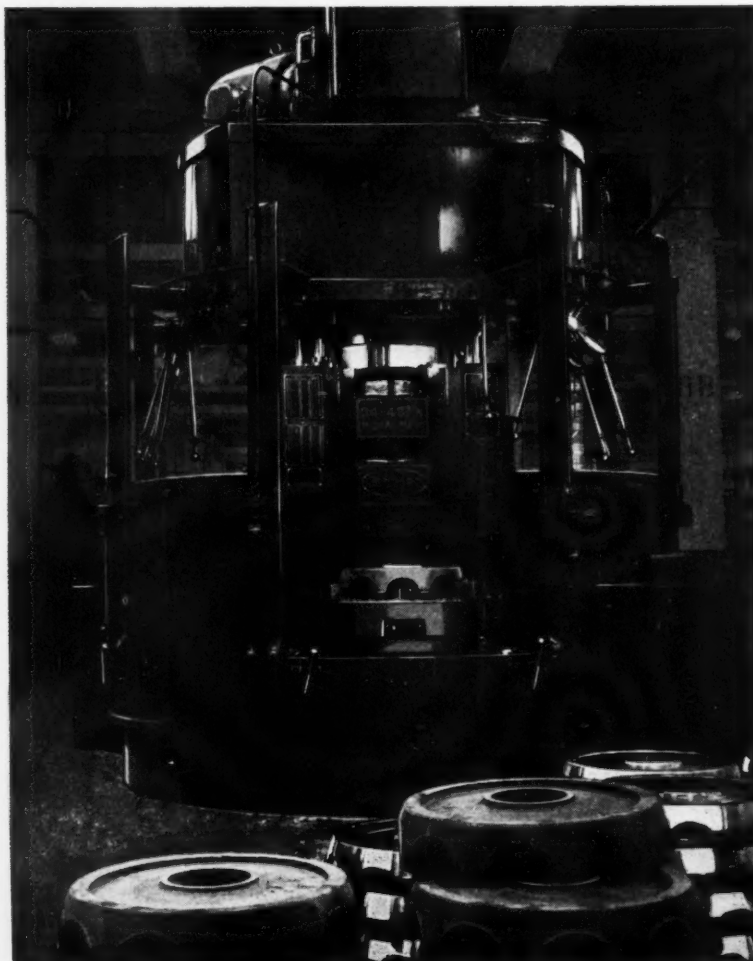
case by means of a handwheel at the front of the machine for centralizing the part. Next two sliding targets are advanced to two of the cylinder openings for checking their spacing and stock allowance.

A top clamp, suspended from a small jib, and normally held in a raised position by a counterweight, is now lowered over the central post in the manner shown until three hinged legs rest on top of the web face. By means of a second handwheel, three fingers that are hinged to the

lower portion of the central post are brought to bear against the inner surface of the web, and the clamp is tightened down.

The setting of the crankcase forging is then checked by means of the three flush-pin gages and three other built-in flush-pins that bear on the top and side of the hub and on another spot on top of the forging. With the work thus carefully positioned, three boring tools cut a spot in three cylinder openings to serve as locating points for the first rough-turning operation.

Turning, boring, and facing of both inside and outside surfaces of the crankcase sections are performed on two four-spindle 34-inch Bullard Mult-Au-Matics. These machines, one of which is illustrated in Figs. 2 and 4, are the largest of their type ever built. Each of the three working stations is provided with two completely independent tool-slides. These machines weigh 49 tons each, and incorporate a number of new features, such as an automatic-feed throw-out which stops the feed before the spindle is allowed to stop. This feature is particularly important when carbide tools are used. The front section of the familiar circular top of the machine has been flattened off to eliminate overhang at the loading station and thus make possible the use of a hoist directly over the chuck for loading and unloading.



**Fig. 3. (Right) Nine Deck Pads are Milled on Front and Rear Crankcase Sections on a Machine of Duplex Design which Enables Simultaneous Operations to be Performed on the Two Sections**

**Fig. 4. (Below) Close-up View of the Fourth and Final Machining Station of the 34-inch Multi-Au-Matic, Showing the Arrangement of the Tools and the Hydraulic Chuck**

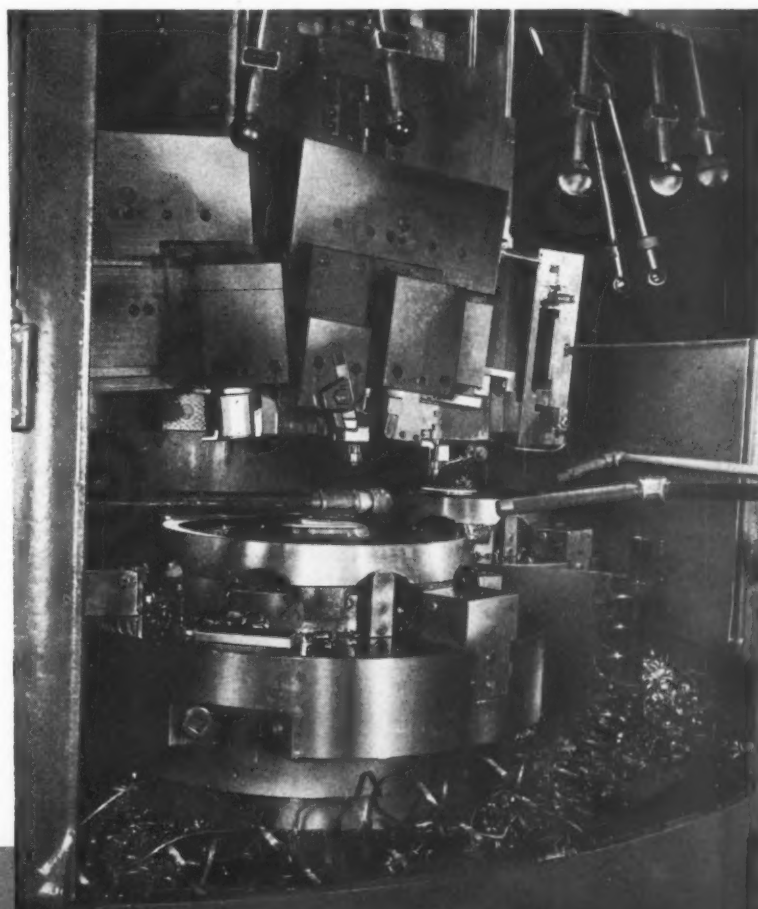


High-speed steel tipped tools, 1 by 1 1/4 inches in cross-section, are regularly employed on this machine, but experiments are being conducted with carbide-tipped tools at work speeds of 25 to 30 R.P.M. and tool feeds of 0.007 to 0.018 inch per work revolution. Tests seem to indicate that it will be possible to obtain a finished crankcase section every seven or eight minutes instead of every eighteen to twenty minutes as in the case of high-speed steel tools. As the chips are very heavy, the depth of cut in these operations being between 1/4 and 3/8 inch, it was necessary to provide hardened steel tool-blocks, ordinary blocks soon becoming damaged severely by the abrasive action of the chips. Many of the cuts are intermittent, and on these cuts best results have been obtained by using carbide tools having from 10 to 20 degrees of negative back rake. In some cases, the side rake is positive, and in other cases, negative. The spherical forming tools employed in this operation have a 15-degree positive side rake and a 20-degree negative back rake.

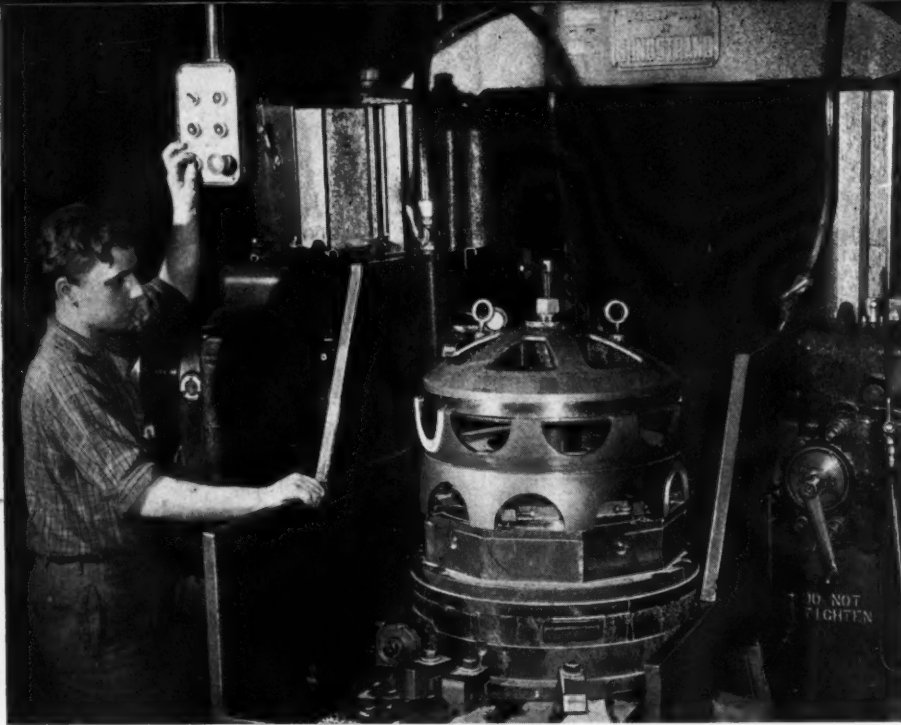
The tool life is three to four times as long as that of similar tools used on the machines originally employed for these operations, due to the greater rigidity of the Multi-Au-Matics, while the output per machine, even when high-speed steel tools are used, is approximately six times greater.

At the loading station of the first Multi-Au-Matic, the crankcase section is placed in a special three-jaw hydraulic chuck, being located on the three previously machined spots and supported on rest buttons. The chuck can be rotated by power through a separate control in order to check the setting of the crankcase section by means of indicators.

The first machining is done at Station 2. Five separate tools are provided on the right-hand head at this station, which is fed horizontally







**Fig. 5. (Left) Eighteen Flat Cylinder Deck Pads are Milled on the Center Crankcase Section in a Duplex Type of Machine Here Illustrated**

**Fig. 6. (Below) Close-up View of a Brushing Unit on the Machine Illustrated in Fig. 8, Showing the Power-operated Feed Mechanism for Applying the Stick Abrasive to Tampico Brush**

0.0216 inch per work revolution. These tools face the flange and hub, and turn a fillet at the junction of the hub and the web face. The left-hand head feeds vertically to turn the outside diameter of the hub, bore the inside diameter of the flange, face a portion of the web, and turn a short section of the outside diameter. It is equipped with four tools, and is operated at a feed of 0.0192 inch per revolution. The part rotates at a speed of 9.28 R.P.M.

At the third station, the left-hand head, feed-

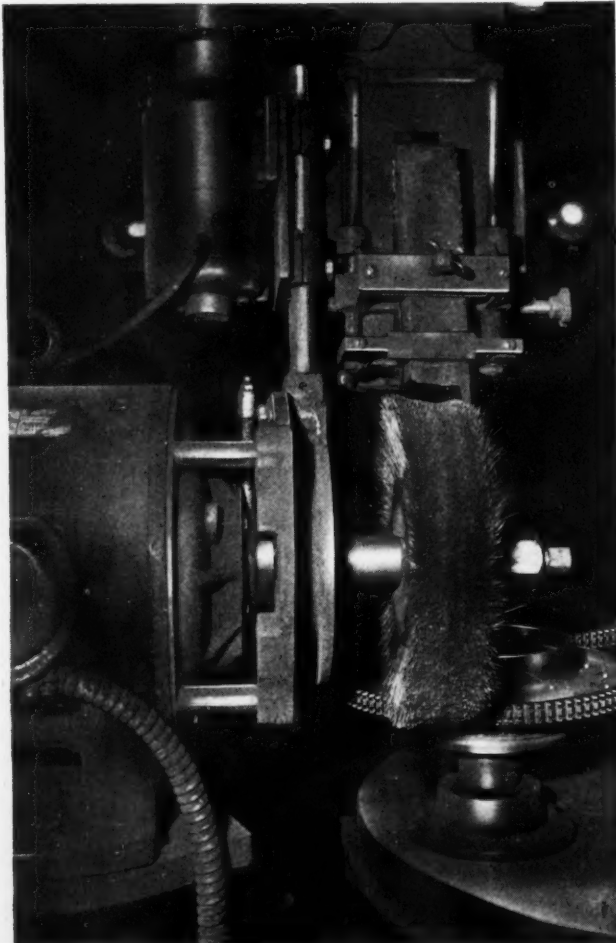
ing horizontally, faces the remainder of the web while the right-hand head, feeding vertically, bores and semi finish-turns the hub, rebores the inside diameter of the flange, and under the control of a roll on a hydraulically operated slide, which engages a fixed cam, turns the spherical outside surface up to the chuck jaws.

At the fourth station of this machine, which is shown in Fig. 4, both heads feed horizontally to rough- and finish-form an under-cut beneath the flange, semi finish-face the hub, and chamfer the inside edge of the flange. The chuck speed is the same as at the other stations, but the feed is 0.0061 inch per revolution.

The crankcase section is inverted on the second Mult-Au-Matic for rough-machining the opposite side and spherically forming the remainder of the outside diameter.

The nine flat faces that form the cylinder decks on the front and rear sections of the Cyclone-18 crankcase are milled on a Sundstrand duplex Rigidmil equipped with a hydraulically operated nine-station indexing fixture, as illustrated in Fig. 3. One crankcase section is placed directly on the fixture with one of the flat faces in line with the right-hand cutter, and the other section is mounted above the first with one of its flat faces in line with the left-hand cutter. A locating plate equipped with dowel-pins separates the two parts and insures proper location, with the faces of the front section staggered in relation to those of the rear section.

The surface machined on each pad is approximately 4 inches wide by 8 inches long, and the amount of stock removed varies from  $\frac{3}{8}$  to  $\frac{5}{8}$  inch in depth, depending upon the particular



**Fig. 7. (Right) Grinding the Spherical Form on Outside of a Cyclone-9 Crankcase by Employing a Straight Cup-wheel with a Beveled Edge**

**Fig. 8. (Below) Formerly a Time-consuming Job when Performed with Tiny Abrasive Wheels, Gear Teeth Edges are Now Rounded Uniformly by Brushing Them with Tampico Brushes**



forging. The feed is at the rate of 1 3/4 inches per minute, with a cutter speed of 41 R.P.M., and from five to six pieces are machined per cutter grind.

A similar machine operates on the crankcase center sections, but since these have previously been form-turned to their double spherical shape, as seen in Fig. 5, considerably less stock is removed, amounting to about 1/4 inch. On this machine an 8-inch diameter high-speed steel cutter is used, the feed being 2 1/2 to 3 inches per minute and the speed 50 R.P.M. Experiments indicate that carbide-tipped cutters can be operated at 260 R.P.M., with a feed of 14 inches a minute. Tool life is estimated to be approximately three times that of the high-speed steel cutters.

To insure the elimination of tool marks, the crankcases are ground all over. One of the most interesting grinding operations is performed on the spherical outside surface by a standard Arter surface grinder set up as illustrated in Fig. 7. The crankcase section is centered accurately on the magnetic chuck, which is adjusted so that the center of the spherical surface is exactly in line with the center of the grinding wheel. The wheel is 11 inches in diameter, and is of the straight cup type with a beveled face that provides clearance. As the crankcase section rotates in a horizontal plane, its edge is intersected by the edge of the wheel rotating in a vertical plane, with the result that a spherical surface is produced having a radius of 11.6 inches.

The center section for Cyclone-18 crankcases has the shape of two spherical segments joined at their smaller diameters, as shown in Fig. 5. This

crankcase part is also ground by the same method as the sections shown in Fig. 7.

One of the most time-consuming operations in aircraft engine manufacture, but one that is absolutely essential, is that of rounding the edges of gear teeth. When gear teeth are rounded by the use of high-speed portable pneumatic tools equipped with mounted abrasive points, considerable dexterity is required, but even with care there are noticeable variations between the teeth, and a moment's carelessness can easily ruin a



they are provided with a plug that is a light push fit for the gear bore.

After loading, the gears are indexed through four stations where motor-driven Tampico brushes bear against the various edges. These brushes can be adjusted to suit the diameters of different gears and can be tilted to any angle in order to cover all surfaces. Abrasive compound in block form is held above each brush, as clearly seen in Fig. 6, and applied to the wheel by an automatic cam-operated device, driven by a separate small motor.

Similar installations have been set up for brushing the threads of bolts and studs and for polishing the outside surfaces of aluminum pistons. The savings vary with different parts, but in the case of one gear, which formerly required 150 minutes of hand work for rounding the teeth, the time for this operation has been reduced to less than 3 minutes.

Milling operations on the magnesium supercharger front section are performed on a Greenlee three-way combined horizontal and vertical machine, of a nine-station automatic indexing design, which is shown in Fig. 9. One of the three heads is equipped with a 7 1/2-inch diameter carbide-tipped inserted-tooth cutter and operates in a horizontal direction. The other two heads operate vertically. One of these heads is equipped with a single 2 1/2-inch diameter cutter, while the other head carries a 3 1/8-inch diameter cutter and two cutters of 2 1/2 inches diameter. Rigidity and alignment of the vertical heads are insured by guide posts which are engaged by bushings in each head as the latter descends to take a cut.

costly gear by grinding too deep and removing all of the hardened case.

Such difficulties have been overcome in the new Wright Aero plant by the use of Packer-Matic machines of the type shown in Fig. 8, which are equipped with an automatic indexing table that has five rotating work-spindles. The machine is enclosed by a large sheet-metal housing, except at the loading point. The work-spindles vary in design according to the particular type of gear being machined, but in general,

**Fig. 9. (Above) Three-way Nine-station Machine which Mills Twenty-nine Pads Automatically around Supercharger Front Sections**



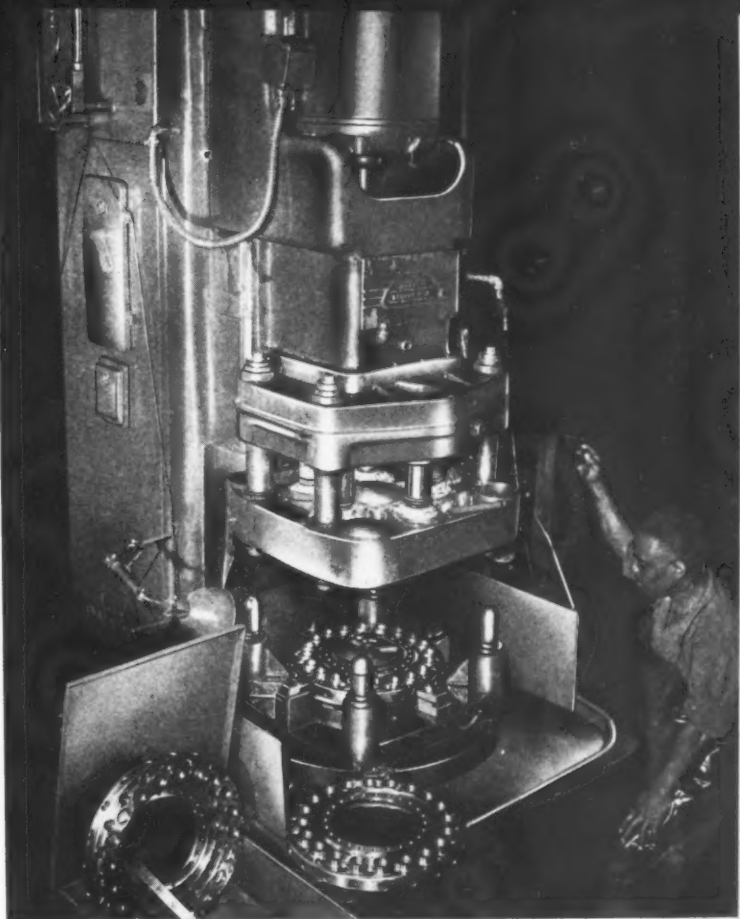
**Fig. 10. (Left) Eighteen-station Machine Designed for Automatically Performing Boring, Counterboring, and End-milling Operations on Supercharger Front Sections**



The supercharger section is located on the table from two reamed dowel-holes, so arranged that the oil-sump pad faces the large cutter on the horizontal head. When the machine is started, all three units advance rapidly and then slow down to a milling feed of 12 inches a minute. While the horizontal unit mills the face of the oil-sump pad, the single-spindle vertical unit mills a small pad diametrically opposite, and the three-spindle head mills a mounting pad and two valve tappet pads. The machine then indexes eight times, and after each indexing, only the three-spindle head operates. With the ninth indexing, the part is returned to the loading position.

Both roughing and finishing cuts are taken on this machine. In the roughing operation, stock is removed to a depth of approximately  $1/16$  inch; the horizontal head has a feed of 13 inches a minute; the single-spindle vertical head 12 inches a minute; and the three-spindle vertical head 20 inches a minute. During the subsequent finishing operation, the feed of all heads is 12 inches a minute.

Following this operation, the parts are transferred to the Greenlee five-way horizontal eighteen-station machine shown in Fig. 10, which has five tool-heads arranged around an automatic indexing table. These tool units are hydraulically operated. Four of them carry single-spindle stub boring heads, and the fifth a two-spindle stub boring head. Each unit is interconnected with the others, so that it will operate only in its proper cycle. If any unit should fail to complete its full advance and return, the entire machine would cease to operate.

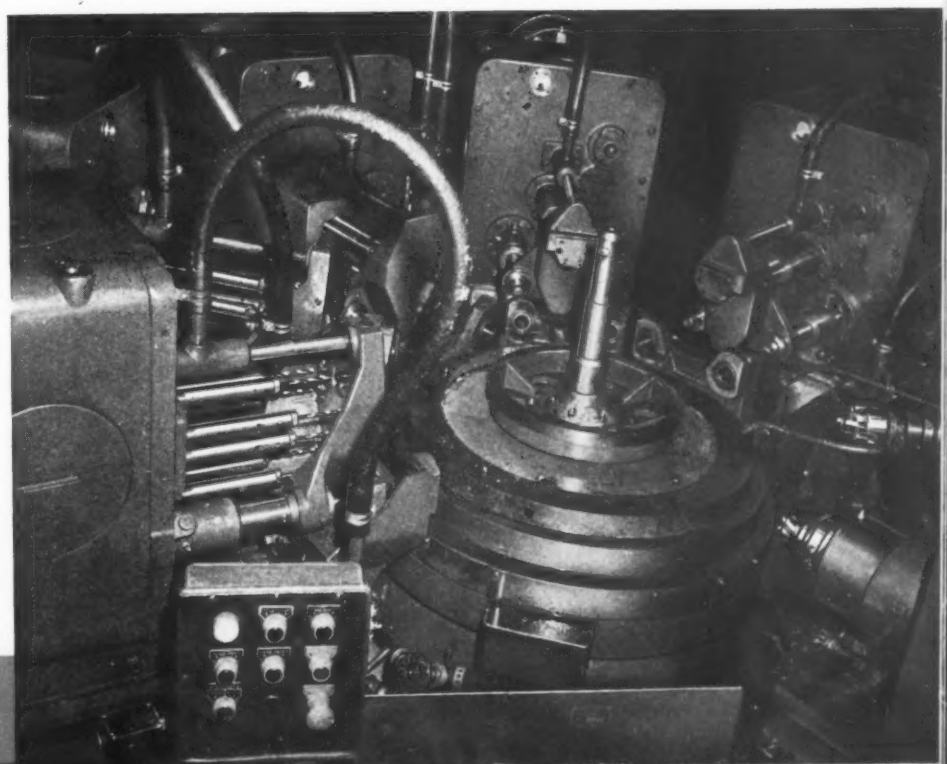


At the first stage of the operating cycle, one unit rough-counterbores a recess in one of the nine mounting pads while another unit rough-counterbores two diameters in one of the eighteen intake ports. The table then indexes and another intake port is rough-counterbored. This sequence is repeated until the eighth indexing, when two holes are bored in the oil-sump pad and another hole is drilled and countersunk in the top pad, in addition to the counterboring operation on an intake port. After the tenth indexing,

**Fig. 11. (Above) Twenty Bosses are Rough- and Finish-hollow-milled from the Solid on Each Side of Speed-reduction Pinion Carriers**



**Fig. 12. (Right) Another Eighteen-station Automatic Machine Employed for Drilling, Reaming, and Counterboring 100 Holes in Supercharger Front Sections**



**Fig. 13. A 2 3/4-inch Diameter Hole is Drilled for a Length of 24 Inches in Propeller Shafts by Employing This Two-spindle Inverted Machine**

Finishing operations are carried out on a similar machine equipped with eight units. This machine finish-bores, countersinks, and taps the eighteen intake ports; and reams, countersinks, and taps the four holes in two breather pads and in each of the nine mounting pads, and the seven holes in the oil-sump pad. These two machines together have replaced eight radial drilling machines and two radial tapping machines, and occupy less than half the floor area. They save the time of twenty-six men per day, and reduce the number of handling operations from ten to two.

The pinion carrier in the propeller speed-reduction mechanism is in the form of a ring with a C-shaped cross-section that is flat on top and bottom. It is necessary to form twenty equally spaced bosses around each flat side of this forging. These bosses are 1 11/16 inches in diameter and approximately 5/8 inch high on one side of the forging and 1/4 inch high on the other. They have a 45-degree chamfer extending around the top edge. The bosses are hollow-milled from the solid on a Snyder five-spindle machine equipped with a four-station indexing table, as shown in Fig. 11. The pinion carriers are located by means of pins that engage reamed holes, and are clamped by four toe-clamps which enter holes around the outer edge of the part.

Five bosses are formed with each pass of the machine, the work being automatically indexed between passes until the twenty bosses have been completed. For machining the lower bosses on one side of the pinion carrier, the work is mounted directly on the fixture, but for machining the higher bosses, it is necessary to insert a spacer ring under the part. The thickness of this ring corresponds to the difference in the heights of the bosses on the opposite sides of the part. The ring eliminates the necessity of changing the position of the cutter stop and enables the same machine to perform both operations in succession.

A 2 3/4-inch diameter hole is drilled through the length of the propeller shaft by the two-spindle inverted Baker drilling machine illustrated in Fig. 13. Following rough- and semi-finish-turning and centering operations on the propeller shaft, a steel collar is slipped over the

a clearance is end-milled on the oil-sump pad in addition to the two counterboring operations. Thereafter, the counterboring operations are repeated until the final indexing, which returns the part to the loading position.

The supercharger front sections are next transferred to the Greenlee seven-way machine illustrated in Fig. 12. The first tool unit of this machine carries seven N (0.302-inch) drills for producing the seven holes in the oil-sump pad. This unit operates only once per cycle of the machine. The second unit carries four drills of the same size for producing four holes in each of the two breather pads. This unit operates twice per cycle of the machine. The third unit carries four Y (0.404-inch) drills for drilling four holes in each of the nine mounting pads, and operates nine times per cycle.

The fourth and fifth units operate only once per cycle, the former being equipped with two D (0.246-inch) drills, and the latter with two combination reaming and counterboring tools that operate on the single top pad. The sixth unit is provided with a combination counterbore for semi finish-forming the two counterbores in each of the eighteen intake ports, and operates eighteen times per cycle. The seventh unit operates nine times to form a combination counterbore and countersink in the nine mounting pads.

part and secured in approximately the middle by means of set-screws. This collar is provided with trunnions over which the ends of a sling may be passed for ease in loading and unloading the shaft into and out of the drilling machine. First, the propeller shaft is placed over one of the machine spindles with the flange end up, being clamped against two V-blocks by means of hinged arms. In this position, the propeller shaft is drilled to a depth of 12 inches. It is then positioned over the second spindle with the flange end down for completing the drilling operation. Two propeller shafts are, of course, on the machine at the same time.

The drills are straight fluted, and are held vertically in the base of the machine, the work being fed downward on the drills. Holes produced in this manner have been found to be remarkably straight, despite their 24 inches of length. Chips fall away from the work and drills, so that the flutes never become clogged and drill breakage is virtually eliminated.

There are six holes in the supercharger rear cover which are bushed from both ends. The bushings must be straight in line and on exact center distances, because they act as bearings for various accessory drive gears. To insure accuracy of the bushings, all twelve are bored simultaneously after assembly in the supercharger rear cover by a Heald Bore-Matic provided with two spindle heads, as illustrated in Fig. 14.

The supercharger rear cover is mounted in a fixture in the center of the machine, being located from the machined outside diameter and two dowels. It is held by equalizing clamps.

When the machining cycle is started, the work fixture first moves to the left to enable six carbide-tipped combination cutters to bore four sets of two bushings each to a diameter of from 1.4995 to 1.5005 inches, and two sets of bushings to a diameter of from 2.062 to 2.065 inches, face the flange of the six bushings, finish-form a two-step counterbore of 3 and 3 1/4 inches diameter on three bushings, form a 3-inch diameter counterbore on one bushing, form two counterbores of 3 3/4 and 4 1/4 inches diameter on two bushings, and chamfer six counterbores 45 degrees. All counterbores are held to size within a total tolerance of 0.002 inch.

Upon the completion of these cuts, the fixture moves to the right-hand tool-head for facing the flanges of six bushings on that side. It then returns to the center of the machine, where the work is unloaded.

To keep abreast of the increased production of detail parts, inspection procedure has been systematized and many inspection operations are performed on conveyors. Engines are assembled on a manually controlled intermittently operated conveyor. At each of the twenty-four assembly stations, red and green lights are suspended above the station in a position that can be observed by the line foreman. All lights are red during assembly, but as each working team completes its operation, the red light is turned out and the corresponding green light switched on. When all the lights are green, the foreman sounds a warning siren before operating the conveyor to carry all engines to the next stations. The conveyor movement automatically turns on the red lights again and switches off the green ones.

**Fig. 14. Twelve Bushings in Supercharger Rear Cover are Bored, Faced, and Counter-bored by Employing a Twelve-spindle Bore-Matic**







# FORD'S CENTRIFUGAL

**At the Ford River Rouge Plant, Large Numbers of Pratt & Whitney Aircraft-Engine Cylinder Barrels are being Centrifugally Cast on a Conveyor Line – Interesting Details of a Fresh Approach to the Problem of Bringing a Vital Aircraft-Engine Part into Mass Production**



# CASTING PRODUCTION LINE

**Y**EARS of experience in centrifugal casting, which now is applied in the manufacture of military aircraft as well as ground vehicles, has done much to speed the Ford Motor Co.'s production of heavy horsepower aircraft engines, Liberator bombers, tanks, and tank engines. In addition to aircraft-engine barrels, Ford now is centrifugally casting cylinder barrels and flywheels for tank engines, spindles for the four-wheel drive armored car and truck, and several landing-gear parts for B-24 Liberator bombers.

Centrifugal casting is done in a rotating mold which spins rapidly to whirl the molten metal away from the center of rotation. The cost of equipment is less than one-third that of forging equipment, and Ford engineers consider many of the castings equal to forgings from a metallurgical standpoint.

## *Development of Centrifugal Casting Process*

The idea of casting centrifugally was conceived about 1809. The process was not applied commercially, however, until the twentieth century, and it is only in comparatively recent years that centrifugal casting has been employed on a high-production basis. The Ford Motor Co. was among the first to apply it to the production of automobile parts. In May, 1937, that company began casting transmission cluster gears and ring gears by this method, and within the next three years the number of firms capable of casting centrifugally quadrupled.

One of the most recent applications of centrifugal casting in the Ford plant is the production of cylinder barrels for Pratt & Whitney 2000-H.P. aircraft engines. The system has worked so successfully that the company has already supplied parts to other aircraft-engine manufacturers and is teaching other foundries how to use the technique.

The centrifugal casting of aircraft-engine cylinder barrels is carried out completely on a mass production basis. To speed the pouring, the mold is brought to the metal by conveyor rather than carrying the hot steel to stationary molds. The arrangement of melting furnaces, pouring facilities, conveyorized centrifugal casting line, mold cooler, and mold preheater is shown in Fig. 1.

The fundamental units of the entire process are the metal mold into which the molten steel is poured and the spinning machine which rotates the mold to produce the centrifugal casting. The mold itself is a relatively simple affair. It consists of a cylindrical casing, flanged and open at one end and provided with a removable section at the other end through which the casting can be removed.

## *Construction of Spinning Mold*

A diagrammatic sketch of this mold is shown in Fig. 2. A baked sand core ring, placed inside the open end of the mold, forms the circular opening through which the metal is poured. If any slight overflow of metal should occur, this would adhere to the sand core and the casting could be removed without damage, which might result if no core were used and excess metal solidified around the flange of the open end of the mold.

One of these molds, with end cover in place, is being lowered onto the rollers of a mold spinning machine in Fig. 3. This is one of eight molding machines which were used in a trial conveyor running around a circular track. The spinning machine shown differs from the present design in that a cover was employed which swung down over the mold during the spinning operation. This cover was found unnecessary, and has been eliminated in the present design of spinning machine, which is shown in Fig. 4.



There are twenty-three mold spinning machines arranged on a continuous conveyor which travels around the oval track shown. Each mold rests on four rollers, two of which engage a groove on the outside of the mold to prevent end-wise movement. A fifth roller is swung over the top of the mold during the spinning operation for safety. Each mold spinning machine is independently driven by an electric motor, mounted in the base of the unit.

After the mold is placed on the spinner rollers, it is carried around to the pouring station, which is on the left-hand side of the oval track shown in the illustration. In the left background, a workman is filling his ladle, which is supported by an overhead carrier that runs around a more or less circular track adjoining the mold conveyor line. When his ladle is filled at the furnace,

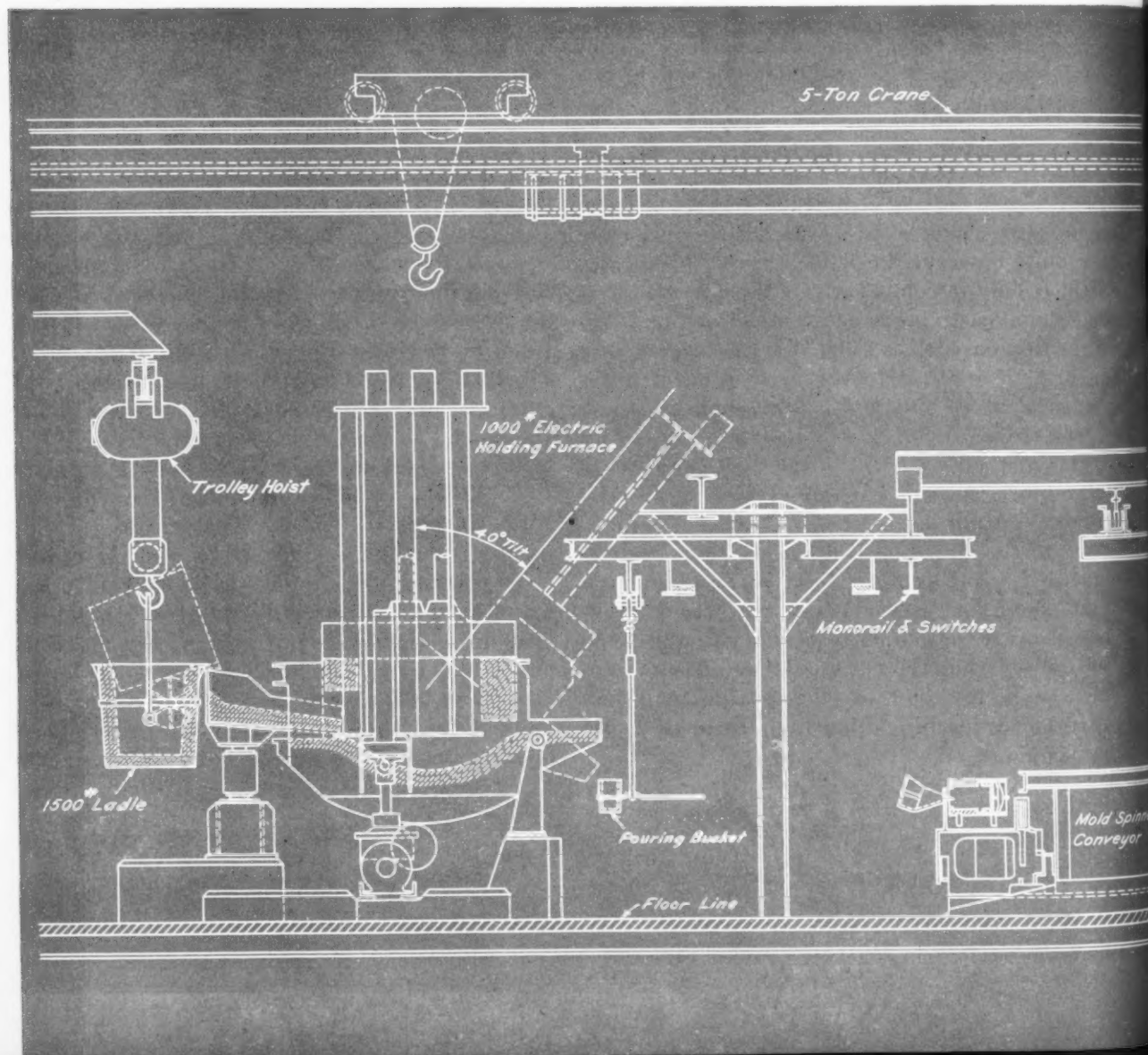
he swings it around to an empty mold, which is moving slowly along the conveyor, and quickly pours the molten metal through the open end. (Pouring is done at a minimum temperature of 2940 to 2960 degrees F., as close to the fusion point of the steel as possible.)

The mold is already in rotation and continues to spin at about 800 R.P.M. as it moves down one side of the oval track. By the time it has reached the end of the straightaway, the metal has solidified in the mold and the upper roller has been raised automatically. The mold ceases to rotate as a limit switch cuts the motor off. One of the molds in which the cast metal has solidified, but is still glowing, is shown being removed from the conveyor line in Fig. 5.

The mold is then placed on a sloping track and rolled down to the unloading position. After the

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Fig. 1. Elevation View of Equipment for Centrifugal Casting of Cylinder Barrels. Mold Spinning Machines (Center) Travel around Oval Track and Bring Molds to Pouring Station. Pour-





end cover has been removed, the casting is pushed out from the mold onto another sloping track, as shown in Fig. 6. The mold now passes along a track to a cooling conveyor, where it is subjected to a water spray. The castings roll down to the weighing station, as shown in Fig. 7.

After being weighed to make sure that there is sufficient metal for finishing, the casting is stamped with the heat number, as shown in Fig. 8. It then goes to a normalizing and annealing furnace, where it is cooled gradually and, after shot-blasting, is ready for machining. When first cooled, the casting has a hardness of about 300 Brinell. After annealing, this hardness is in the range of 179 to 207 Brinell.

After being cooled under a water spray, the mold is sprayed with a light coat of refractory wash. The mold end cover is then dropped into

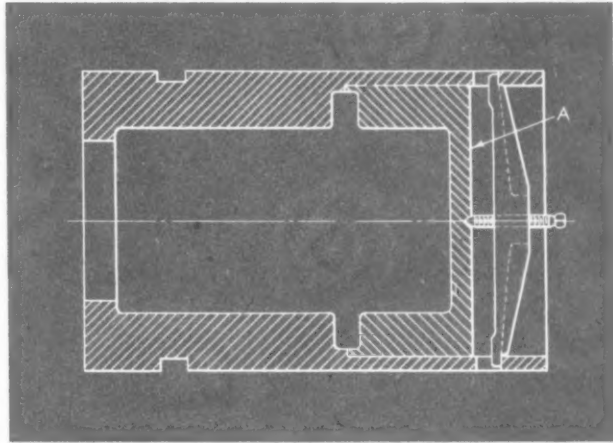
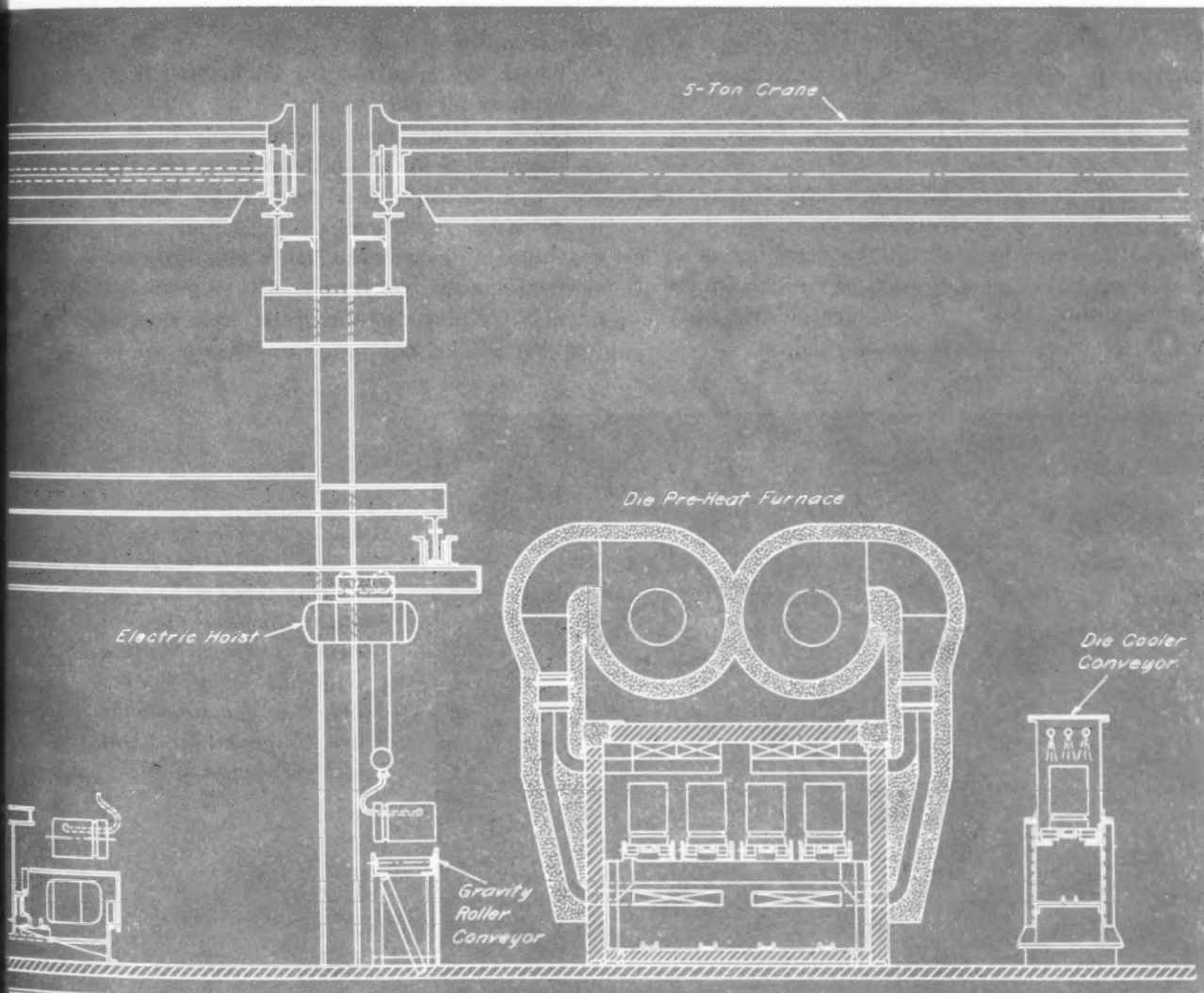


Fig. 2. Closed End A of Cylinder Barrel Mold can be Removed to Discharge Casting. A Sand Core Ring (Not Shown) is Used in Open End

ing Buckets are Carried around Continuous Overhead Track between Furnace and Mold Line. Molds are Cooled (Right), and after Reassembly are Preheated (Right) before being Used again

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*Fig. 3. Placing Mold on Spinning Machine Rollers. Machine Shown is of a Design Used in Trial Conveyor Line*



place again, and the mold passes through a preheating furnace. Some of the molds that have just passed through the preheating furnace are shown in Fig. 9. In the background, a workman is inserting the clamps which hold the ends of the molds firmly in place. The molds are now assembled and at the proper temperature to be used again in the centrifugal casting operation.

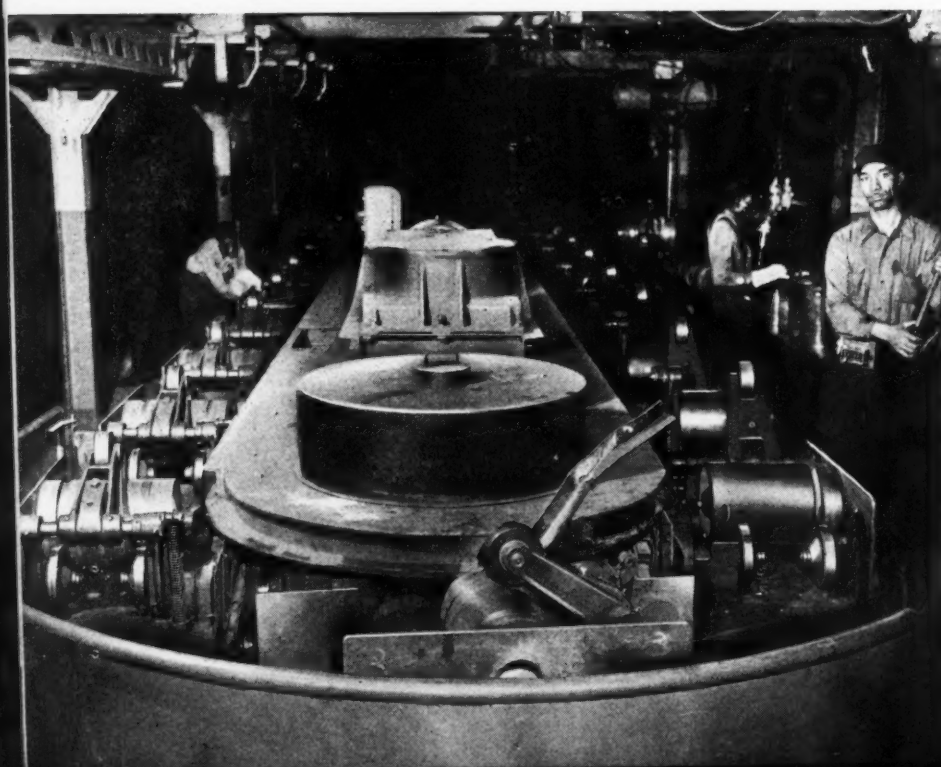
#### *Advantages of Centrifugal Casting*

Many advantages are claimed for this method of producing aircraft-engine barrels. A considerable saving in high-quality steel is one. The centrifugal casting requires 40 to 42 pounds of oil-hardening steel. A comparable forging requires 72 pounds of the same steel.

In the centrifugal casting there is but a small percentage of excess metal and little rough-machining is required. In the forging, starting with solid steel blocks, the rough-machining must remove 51 per cent of the metal. The difference in material removed saves at least fifteen minutes in machining time on a cylinder barrel, eighteen of which are required for each 2000-H.P. Pratt & Whitney aircraft engine.

These castings are of extremely high quality, as the molten metal chills quickly from the outside mold wall toward the center, giving little opportunity for segregation in that part of the casting which remains after machining.

Getting approval for substituting the cast-steel barrels in place of forgings was the toughest problem. The company engineers knew what



*Fig. 4. Present Conveyor Line Carries Twenty-three Mold Spinning Machines around Oval Track. Pouring is being Done in the Left Background. Molds are Unloaded in Right Foreground*

**Fig. 5. Unloading Mold from Spinning Machine. Metal has Solidified to Form Casting but is Still Red-hot**



could be done with centrifugally cast steel and were satisfied that these cylinder barrels could meet and exceed the required physical characteristics. But no one else had any experience with these cylinders in service, and Pratt & Whitney approval was necessary before the cast barrels could be employed on the Ford-built engines.

The first centrifugally cast cylinder barrels, produced for Rolls-Royce engines, were tested at the Massachusetts Institute of Technology, and engine tests were recommended after the barrels were declared to be satisfactory. After passing tests on a single-cylinder engine, the barrels passed ground tests on a multi-cylinder engine. Army Air Force engineers at Wright Field then became so interested that they asked to have an

engine built with cast cylinders and sent to them for further tests. As a result of these tests, authorization was granted to use these centrifugally cast barrels on all the Pratt & Whitney engines that the Ford Motor Co. was building.

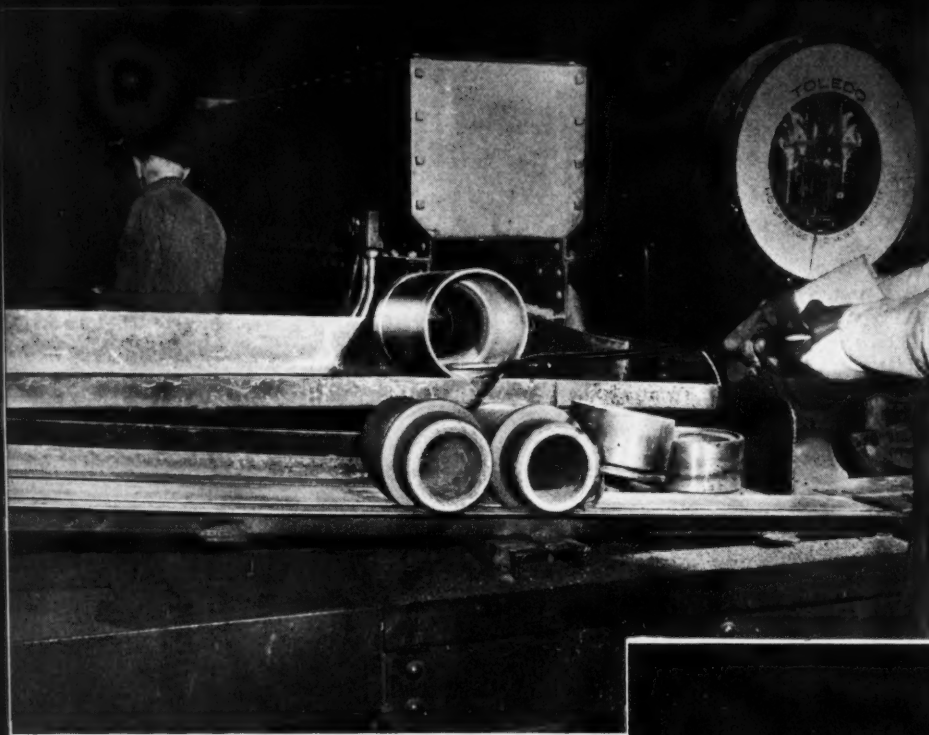
#### ***Centrifugal Castings and Forgings Compared***

Under hydraulic tests, the strength of centrifugally cast barrels made of S A E 4140 steel has been found to be 9200 pounds per square inch and above. In Fig. 10, a centrifugally cast cylinder barrel is shown that has withstood a hydrostatic test pressure of 10,000 pounds per square inch without failure. When failure does occur in a centrifugally cast cylinder barrel, it invariably bursts in varying directions.

**Fig. 6. Upon the Completion of the Casting, the Closed End of the Mold is Removed and the Casting is Pushed out onto Gravity Conveyor Track down which it Rolls to Weighing Station Shown in Fig. 7**



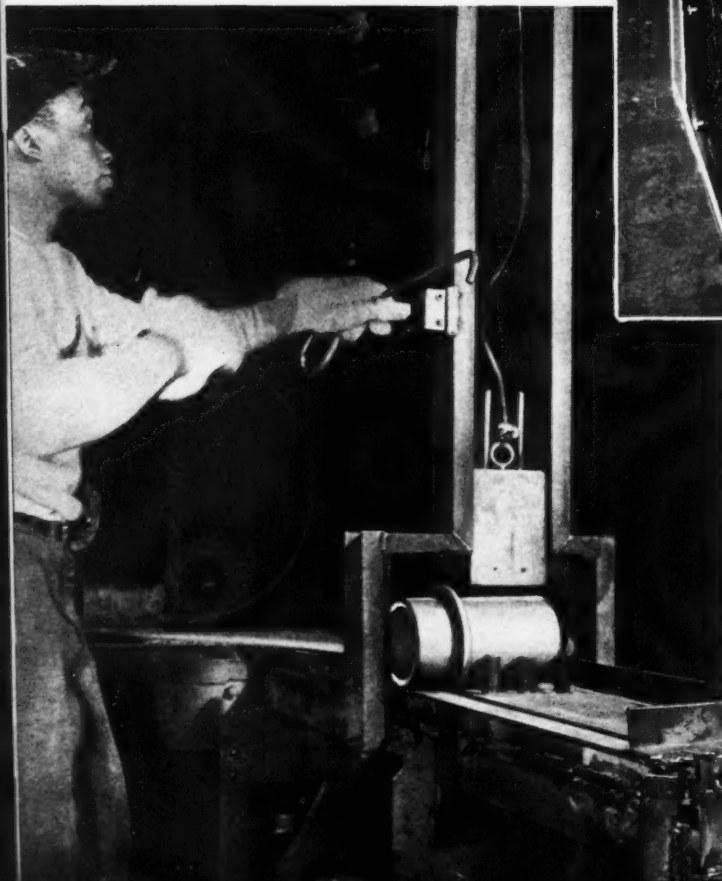




**Fig. 7. (Left) Castings Roll down to Weighing Station while the Molds Await Cooling in Water Spray Machine Shown in Center Background**

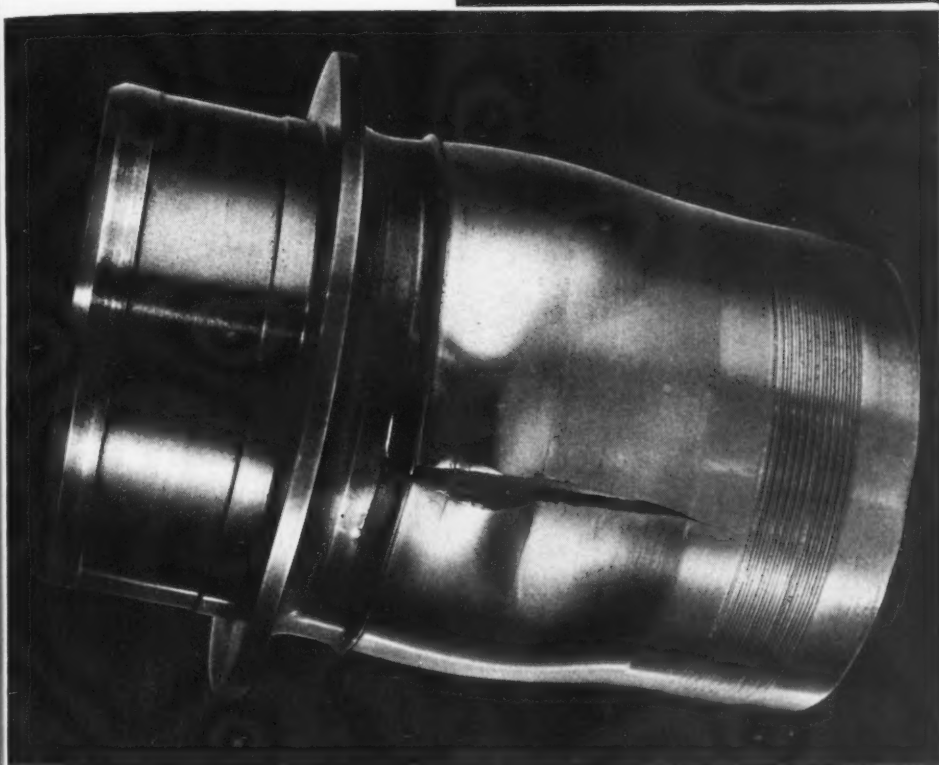


**Fig. 8. (Below) Stamping the Heat Number on Cylinder-barrel Castings just before the Annealing Operation is Performed**



**Fig. 9. (Above) Molds with Closed Ends in Place Ready for Clamp Fastening are Shown Emerging from Preheating Furnace. The Next Step will be the Placing of the Mold on the Spinning Machine**

**Fig. 10. This Centrifugally Cast Cylinder Barrel was Subjected to 10,000 Pounds per Square Inch Hydraulic Pressure without Failure**



**Fig. 11. A Similar Forged Cylinder Barrel Failed at 8700 Pounds per Square Inch under Hydraulic Test. Centrifugally Cast Barrels have Repeatedly Shown Greater Strength under Hydraulic Test**

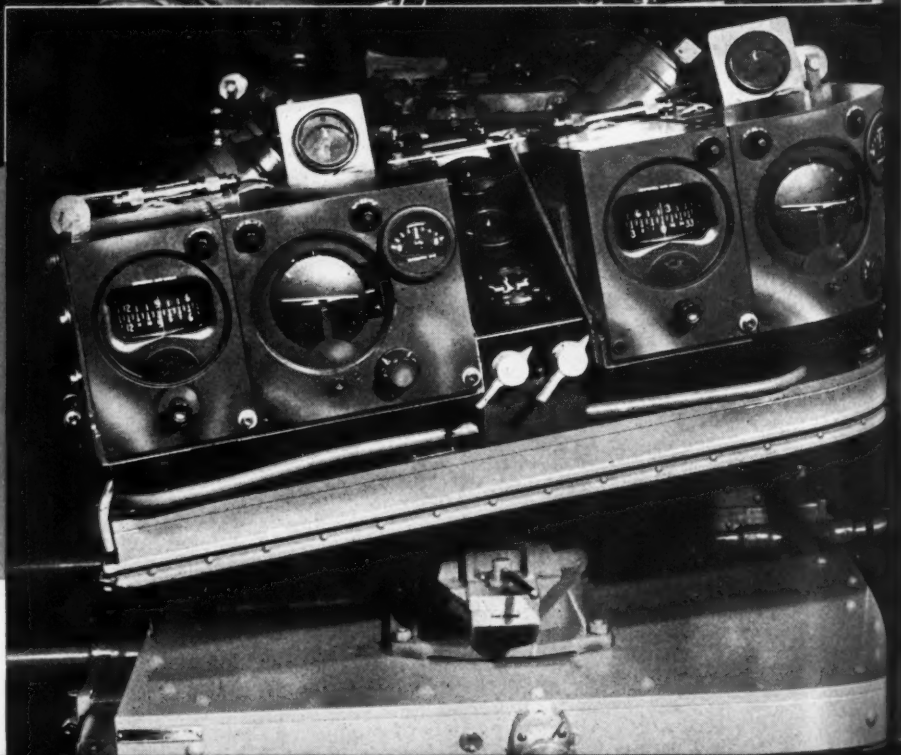
In the case of forged barrels, any bits of slag or other impurities in the metal are lengthened during the rolling process and produce thereby a directional weakness in the metal; thus a forged cylinder barrel is likely to break or crack in a straight line. Fig. 11 shows a forged cylin-

der barrel that failed under a hydrostatic test pressure of 8700 pounds per square inch.

With the new conveyORIZED centrifugal casting set-up, it is expected that some 400 cylinder liners an hour will be produced with about fifteen men working on the molding line.



# WORKING TO "TENTHS" SPERRY





# ON THE AIRCRAFT GYROPILOT

**Exactng Methods of Machining, Assembly, and Inspection  
are Employed by Sperry in Building the Gyropilots Now  
being Used in Thousands of Combat Planes. Here is Fine  
Instrument Making on a Large-Scale Production Basis**

**By GEORGE A. RICHROATH  
Factory Superintendent Nassau Plant  
Sperry Gyroscope Co.**

**I**T was in 1929 that James H. Doolittle, then a lieutenant, took off in a plane with a hooded cockpit, and after circling the field, landed again without once seeing outside of his enclosure. This startling demonstration of blind flight was the forerunner of many others. Its success was due in part to two new instruments developed by the Sperry Gyroscope Co., which today make up the Gyropilot. These instruments were subsequently adopted for use in the majority of transport planes throughout the world.

Now it is commonplace for long-range bombers and patrol craft, which must be flown for many hours in going to and from their objective, to be piloted over a considerable part of their flights by this automatic mechanism. Because of its aid, the pilot is relieved of much fatigue and is better able to assist in the accomplishment of the mission when the objective is reached. On long-range observation and scouting planes manned by a crew of only two, this mechanism is, in effect, a co-pilot. In these planes, the pilot must fly, navigate, fight when necessary, and do a large part of the observing as well.

The Gyropilot relieves the human pilot of many hours of actual plane operation, and enables him to concentrate on improved navigation and more complete observation. In addition, it improves the accuracy of dead reckoning and celestial observation, and it also converts the

aircraft into a stabilized platform, which offers great advantages in operating the military equipment over the objective.

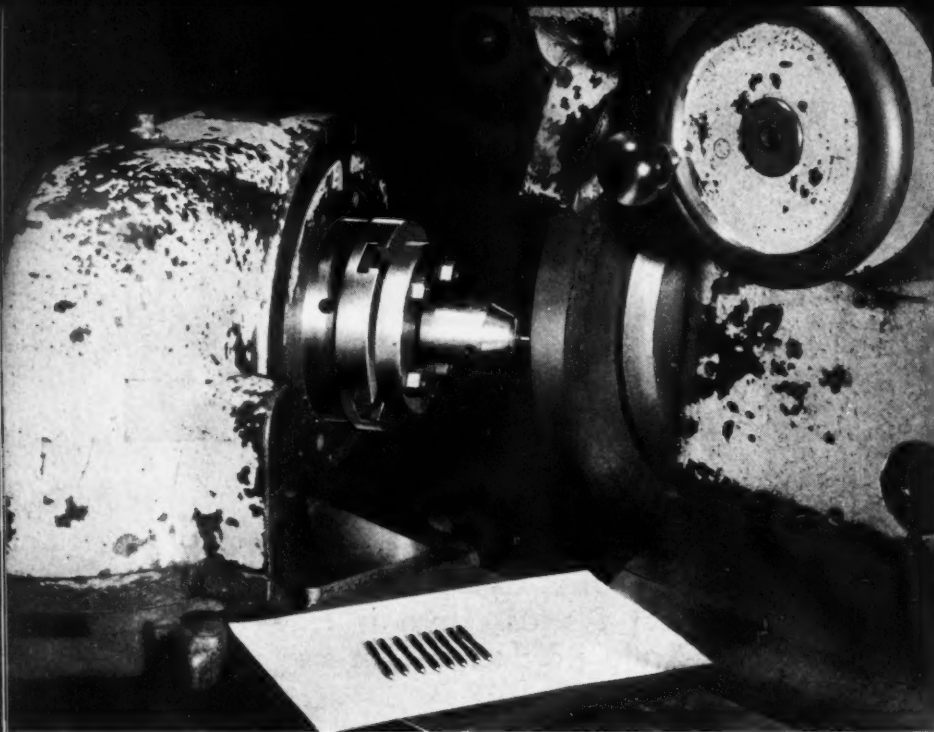
To perform these duties, the Gyropilot must function with the greatest of precision. This accuracy of performance derives, in turn, from the exacting methods of machining, assembly, and inspection employed in manufacturing thousands of these units for the Army and the Navy flying forces.

The A-3 Sperry Gyropilot, which is the subject of this article, is composed of two separate control units called the "Gyro-Horizon" and the "Directional Gyro." These two units actuate air relays, which, in turn, control hydraulic Servo units to move the rudder, elevators, and ailerons of the airplane.

The "Directional Gyro" unit contains a free gyroscope (free to move about three axes), which indicates the position of the plane with regard to any established course, regardless of the plane's position, or rather "attitude," in the air. This is the instrument shown at the left of each pair of units mounted on the Scorsby testing machine in the heading illustration. It has two "compass" indicating scales. One scale is set to the course desired, and the other indicates the course actually being flown.

The "Gyro-Horizon" or bank-and-climb gyro is shown at the right of each pair of units. It





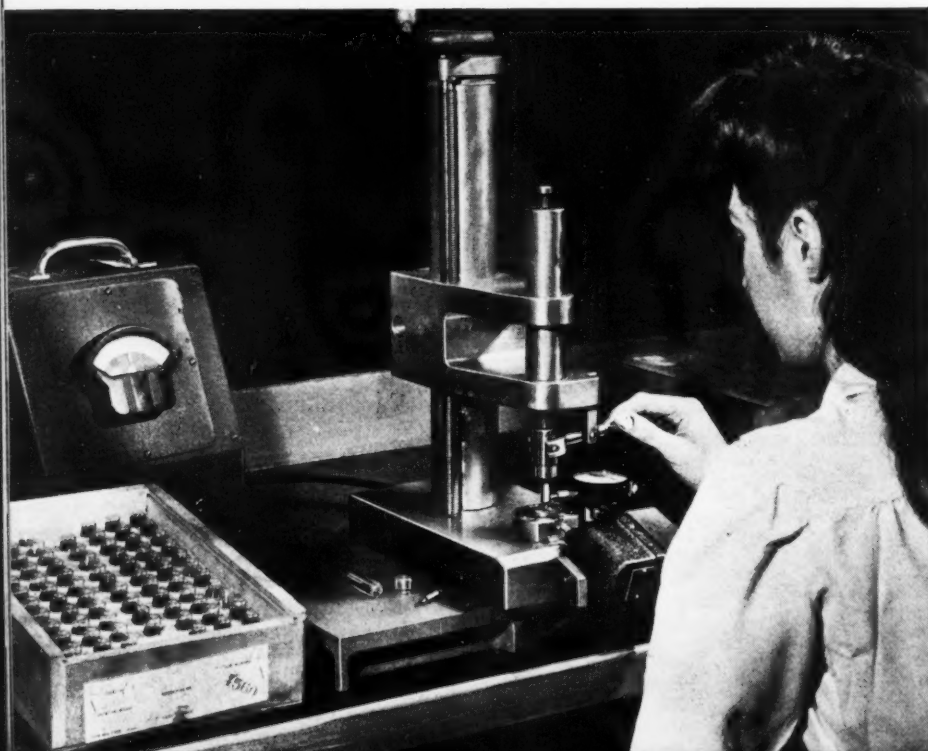
**Fig. 1. Grinding Conical Point on a Pivot Only 1/16 Inch in Diameter. Grinding Wheel Spindle has 1/8 Inch Lateral Oscillation. Tolerance on Concentricity is 0.0001 Inch**

will be seen that the face of this instrument consists of a miniature aircraft silhouette which is set to a fixed position, and a moving line which acts as an artificial horizon. The position of this miniature aircraft with relation to the artificial horizon immediately tells the pilot whether his plane is headed down or up and whether it is banking to the right or left and to what extent.

The heart of the "Directional Gyro" and the bank-and-climb indicator is, in each case, a small rotor, which revolves at high speed under air impulsion. This small rotor tends to maintain a fixed axial position, regardless of the position of the instrument frame which carries it. The position of the frame is, of course, dependent upon that of the airplane.

As the position of the instrument frame changes with respect to that part of the instrument which is held in a fixed position by the rotor, various air ports are opened or closed, depending upon the way in which the instrument has been set; air relays are actuated and the hydraulic Servo units move the rudder, elevators, and ailerons as required. In other words, should the plane tend to veer from a pre-set course, these two instruments would actuate the control elements of the plane in such a way as to quickly correct the error.

In Fig. 1, the end of a 1/16-inch diameter pivot for the flipper body which opens and closes the air ports in one of the instruments is being ground to a high surface finish and exact conical



**Fig. 2. Inspecting a Rotor-shaft Pivot for Concentricity. A Dial Indicator Gage Measures Shaft and Electric Limit Gage Measures Cone, which has a Tolerance of Only 0.0001 Inch**



**Fig. 3. Measuring Flatness of Gear Face with Optical Flat. Gear and Air Nozzle to which It is Fastened are Shown in Foreground**

shape. A similar operation is performed on the other end of the pivot. The concentricity between both cones and the body of the shaft is held within a tolerance of 0.0001 inch. In a subsequent operation on the same machine, these pivot ends are lapped to a high finish.

A Landis grinding machine having a grinding wheel spindle that oscillates laterally about 1/8 inch is employed, together with a 38-120 grinding wheel and a 37-500-590 lapping wheel. To insure that the required concentricity is obtained, a specially designed spring collet chuck is used to hold the pivot.

In Fig. 2 is shown the operation of gaging the rotor-shaft pivot points and body for concentricity. This is the shaft on which the gyro rotor is pressed; and since it must revolve at a speed of approximately 11,000 R.P.M. without any vibration, very close tolerances are maintained in its machining. In this inspection operation, the shaft is supported in a vertical position between two ball bearings, and the operator rotates the shaft with her left hand while gaging the amount of out-of-roundness.

A dial indicator gage is used to measure the concentricity of the shaft body, which has a tolerance of 0.0003 inch, while a General Electric limit gage is used to measure the roundness of the lower pivot point, which must be within a tolerance of 0.0001 inch. The reason for using an electric limit gage for the latter measurement



is that the roundness of these cones is so critical that the slightest errors in the cones must be measured. Mechanical indicators are not nearly sensitive enough.

Another highly precise operation is shown in Fig. 4, where the face of the air nozzle (held by the workman at the left) and the face of the nozzle spur gear (held by the workman at the right) are lapped to a flat surface within a tolerance of 0.00001 inch and to a finish that is held within 2 micro-inches. The reason for the

**Fig. 4. Lapping Surfaces of Air Nozzle and of Nozzle Gear to Flatness within 0.00001 Inch and to a Finish within 2 Micro-inches. Close Fits are Required to Prevent Air Leakage**







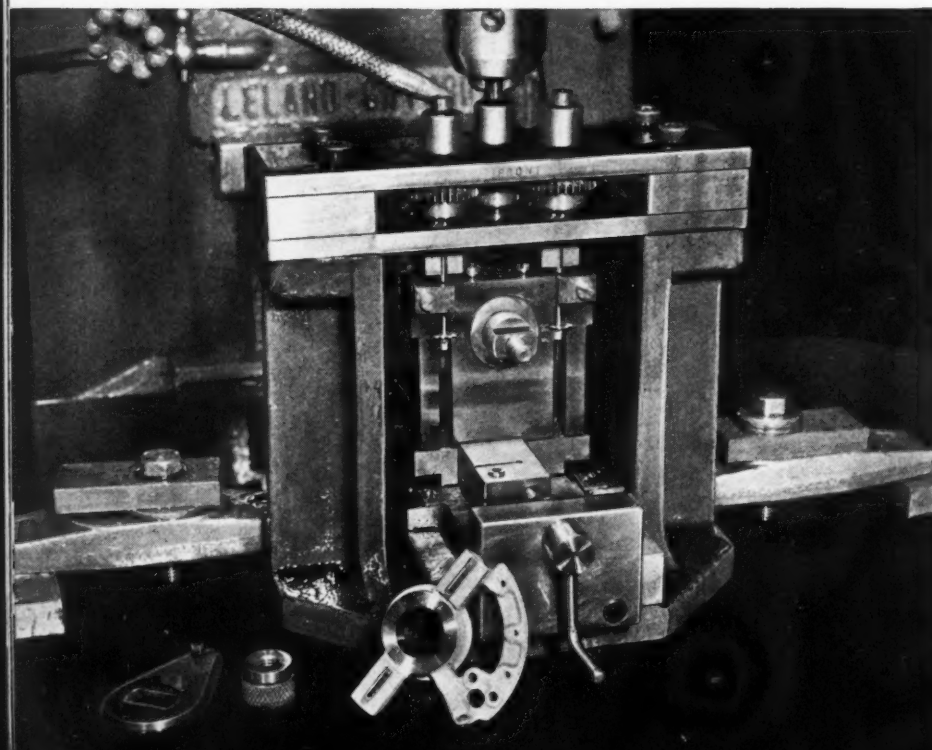
**Fig. 5. Lapping Surfaces around Air Slots and a Shoulder around Shaft Hole to within 0.00005 Inch of Parallelism with Opposite Side of Gear**

high degree of accuracy required is that both gear and nozzle carry ports that are to be lined up with each other and through which air must pass. The mating surfaces of these two parts must fit so closely that there can be no leakage of air between them.

In Fig. 3, the flatness of this gear face is shown being inspected by an optical flat. With this optical flat, bands of light and shadow are seen, which, if the surface were perfectly flat, would be absolutely straight. When the bands are curved, the amount of their maximum displacement from a straight line indicates the amount that the surface is concave or convex at that particular point. A difference of one-millionth of an inch can be measured in this way.

Fig. 5 shows one of the last operations on the upper plate assembly before the final assembly of the instrument. The purpose of this lapping operation is to bring the flat surfaces adjacent to the air ports or slits and the shoulder around the shaft hole into close parallelism with the opposite face of the gear. After grinding, these surfaces may be anywhere up to 0.0002 inch out of parallelism. After this lapping operation, they are parallel within 0.00005 inch. Here, again, extreme accuracy is necessary in order to prevent leakage of air, which would affect the correct operation of the instrument.

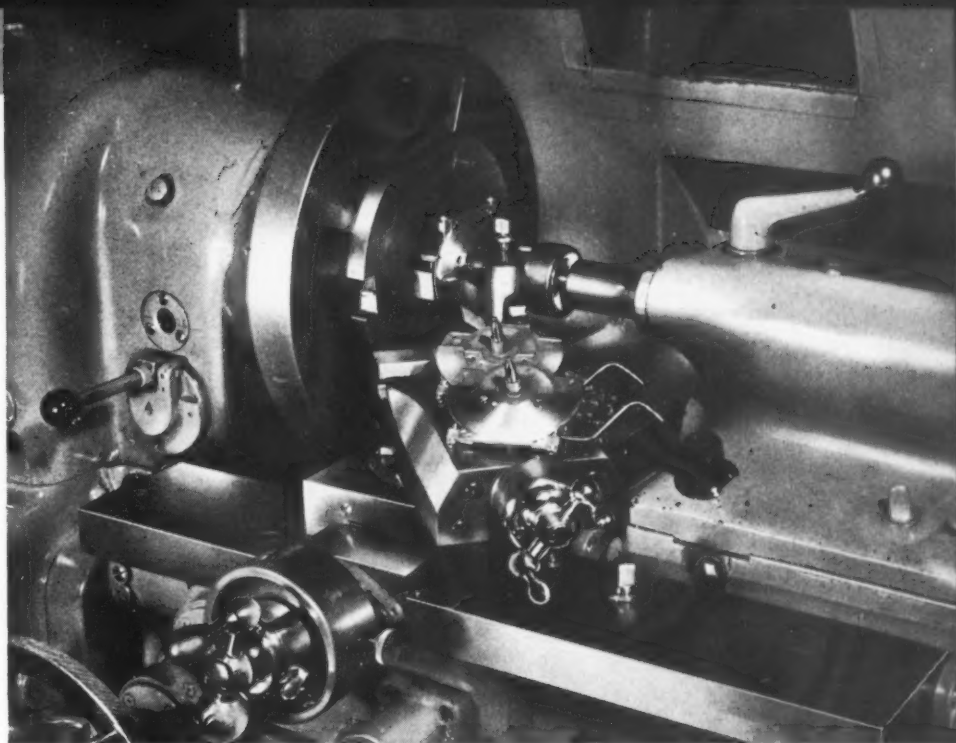
The equipment used for cutting the slits in the air nozzle is shown in Fig. 6. It consists of a Leland-Gifford drilling machine equipped with a



**Fig. 6. Special Fixture for Cutting Air Nozzle Slits, Employing Small Milling Saws Geared to the Drilling Machine Spindle**



**Fig. 7. Turning Face of Bail Assembly with a Diamond-tipped Tool. Turning is Done after Assembly because the Tolerance is Only 0.0001 Inch**



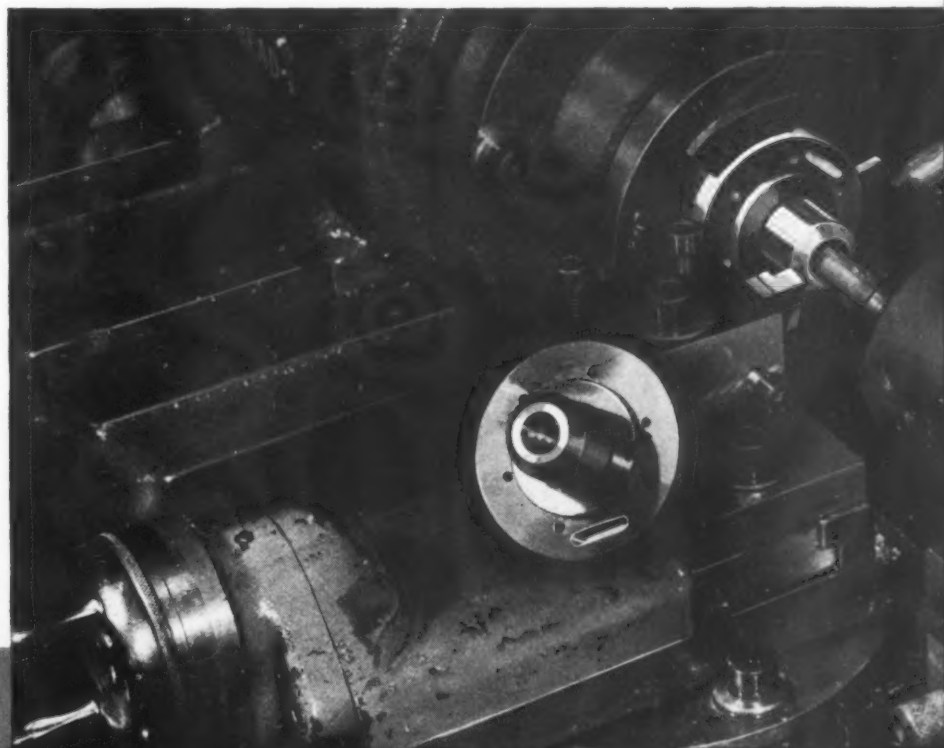
special fixture. Two small milling saws are geared to a shaft which is gripped by the drill chuck. These saws are geared to revolve at about the same speed as the drilling machine spindle. Each saw cuts a slot 0.020 inch wide to a tolerance in width of 0.001 inch, and a tolerance in alignment of one slot with the other of the same amount. A finished work-piece with a slot cut on each side of the large center hole is shown in front of the fixture.

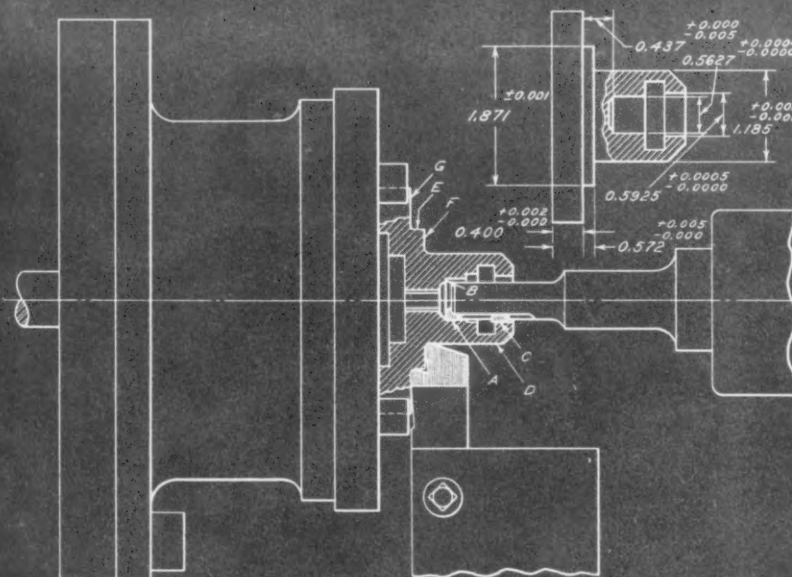
Another highly precise machining operation is shown in Fig. 7. Here the face of a bail assembly is being turned with a diamond-pointed tool on a Monarch tool-room lathe. This part must be turned after the bail is assembled on the shaft, since a tolerance of only 0.0001 inch in

squareness of the bail face with the shaft axis is allowed. The fine finish obtained in this turning operation is clearly visible in the finished piece shown at the front of the upper tool-holding slide; an unfinished piece is shown directly behind it. In using the diamond-pointed tool, an extremely light cut must be taken to avoid bending the work-piece and thus causing inaccuracy in the resulting surface with relation to the shaft axis. It is of interest to note that about 1000 of these aluminum-alloy bail assemblies can be turned for each change in the diamond-pointed tool.

An interesting boring and turning operation on a lower bearing housing which is performed on a Heald Borematic is shown in Figs. 8 and

**Fig. 8. Multiple Turning and Boring Operation on Lower Bearing Housing. The Boring-bar has an Overhung Support**





**Fig. 9. Arrangement of Cutting Tools for Operation Shown in Fig. 8. Boring-bar Cuts Diameters A and C and Faces Inside Shoulder B. Double-pointed Cutting Tool Turns Diameters D and E and Faces Shoulders F and G**

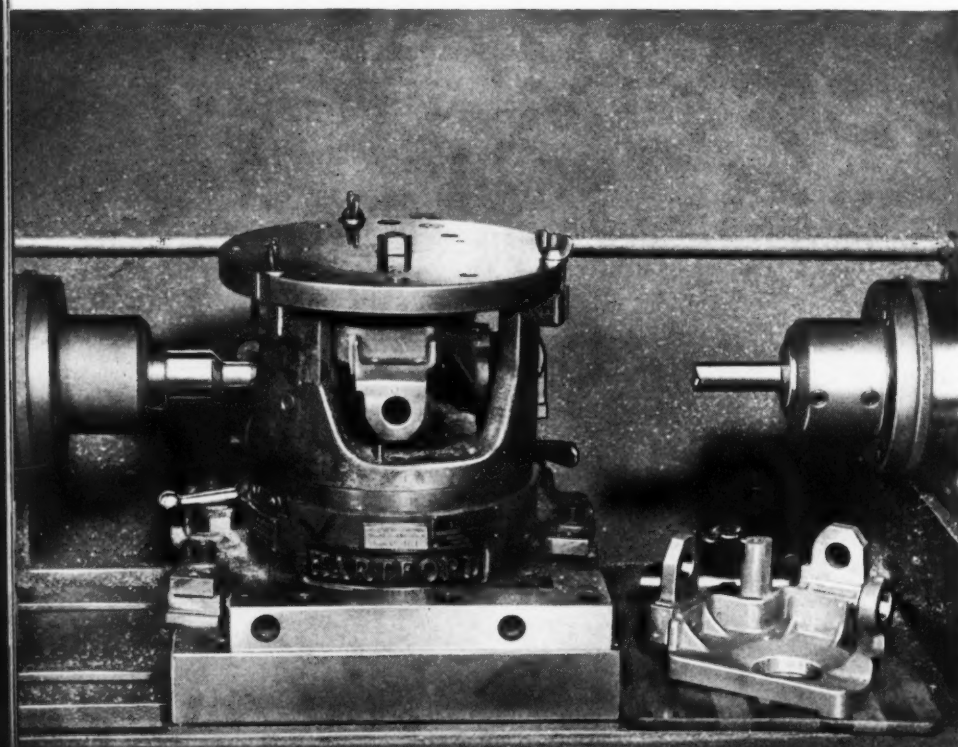
9. A boring-bar with two cutters arranged as shown in Fig. 9 is held in an overhung support, while a turning tool with two cutting points is used in the side carriage to form the outside contour. The use of the overhung boring-bar support, designed by Sperry, permits the tool carriage to be employed at the same time as boring and turning operations are being carried on.

The first boring cutter is used to obtain a diameter at A of 0.5627 inch, plus 0.0004 inch, minus 0.0000. It also faces the shoulder at B. The second boring cutter is used to obtain a diameter at C of 0.5925 inch, plus 0.0005 inch, minus 0.0000. The special tool held in the side carriage turns the diameter at D to 1.185 inches, plus 0.0002 inch, minus 0.0000, and the diameter at

E to 1.871 inches, plus or minus 0.001 inch. The two cutting points of this turning tool are also used to simultaneously face off surfaces F and G by drawing the tool outward after it has finished turning surfaces D and E.

Another interesting operation performed on a Heald Borematic is shown in Fig. 10. Opposite holes are being bored in a "Gyro-Horizon" frame. Their axes must be in line within 0.0005 inch. The axis of a third hole bored on this machine must be perpendicular within 0.0005 inch to the axes of the other two holes and on the same horizontal plane within 0.0005 inch per inch.

The first two holes are bored to a diameter of 0.8125 inch, plus 0.0002 minus 0.0000 and the third to a diameter of 0.9375 inch, plus 0.0006



**Fig. 10. Boring Holes in "Gyro-Horizon" Frame to Close Tolerances. Opposite Holes Must be in Line within 0.0005 Inch, and Axis of Third Hole Must be Perpendicular to that of Other Two within 0.0005 Inch**





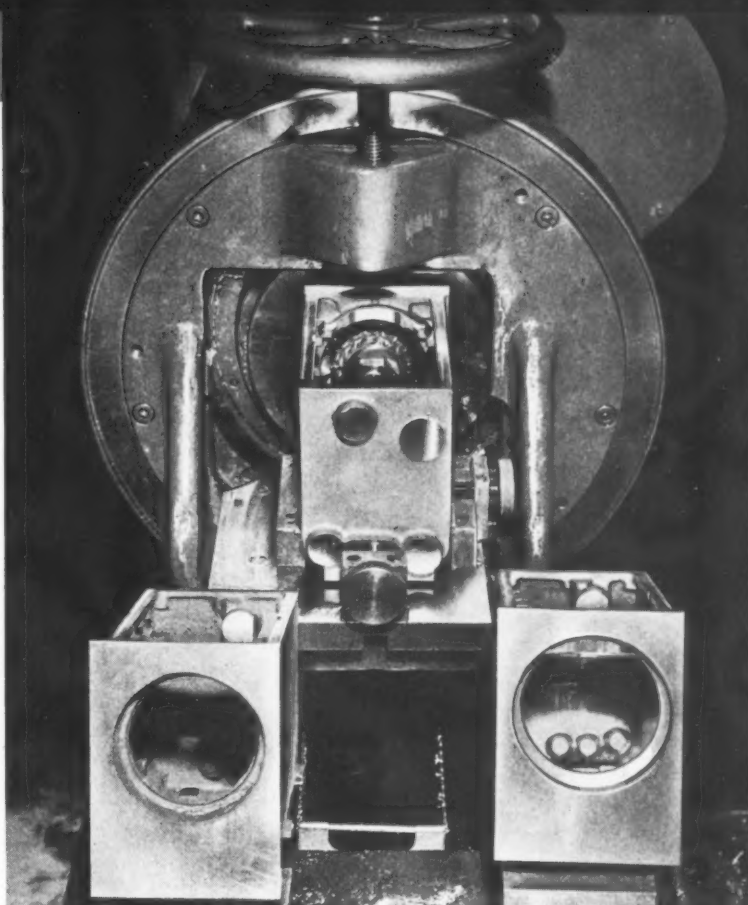
**Fig. 11. Milling Face Opening of "Gyro-Horizon" Case on a Planetary Milling Machine. Two Diameters and Face of Flange are Milled with Form Cutter. Finished Piece is at Right, Unfinished at Left**

minus 0.0000. The magnesium die-casting is held in an inverted position by a plate which rests on a rigid three-pronged support. A Hartford Super-spacer is used to index the work-piece.

In Fig. 12, a pendulum body is being straddle-milled on a Sundstrand automatic milling machine equipped with an automatic indexing attachment. Specially designed roughing cutters with four inserted carbide teeth are employed. These teeth are made only 1/4 inch wide, so that the cutters can pass through the narrow clearance space between the work-piece and the holding clamps.

The face opening of a magnesium case for a "Gyro-Horizon" instrument is being milled on a Hall planetary milling machine in Fig. 11. A form cutter is used to mill the large diameter, face off the inner flange, and mill the smaller diameter. The concentricity of these two diameters, the larger of which is about 6 1/4 inches, must be within 0.001 inch. In operation, the form cutter feeds in to the required depth and then rotates around in planetary fashion to generate the required surfaces. About two minutes is required to rough- and finish-mill these surfaces. The entire cycle for each cut is automatic.

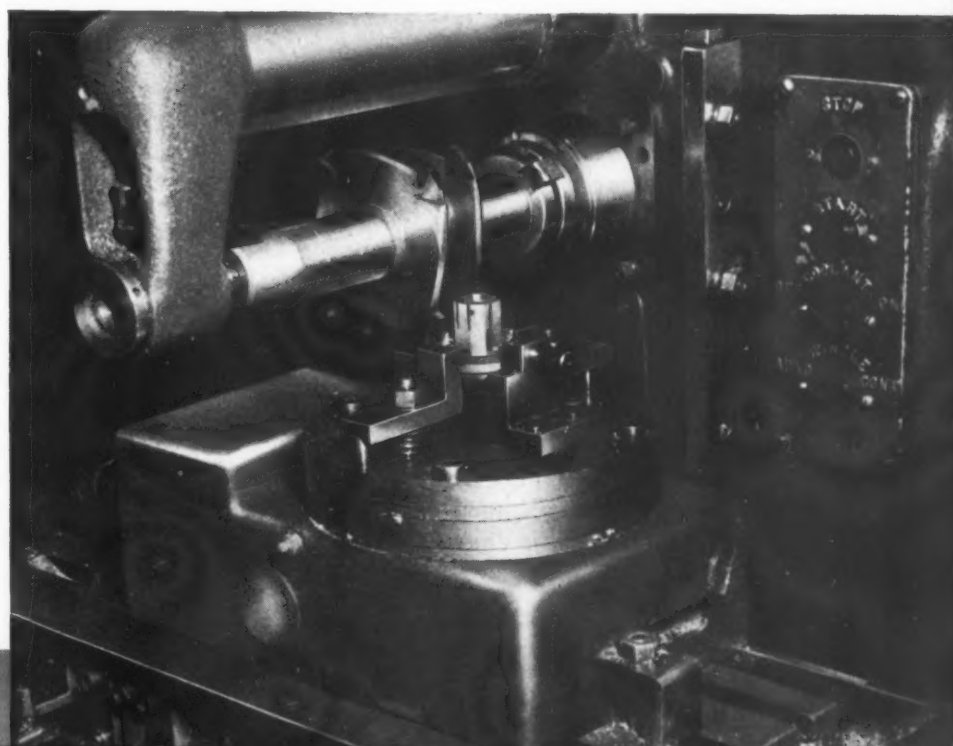
Another exacting operation on an assembled work-piece is shown in Fig. 13. Here a back cover on which two brackets have been mounted



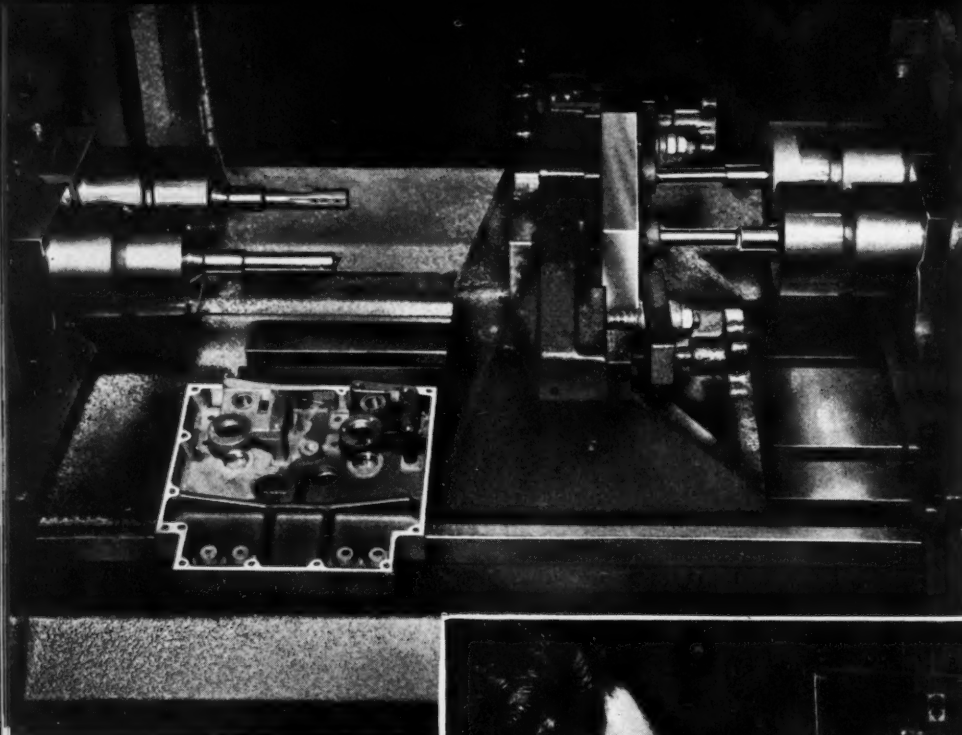
is being bored on an Ex-Cell-O horizontal multiple-spindle boring machine. Each of the two spindles at the left bores two 1/2-inch holes with a tolerance on the diameter of 0.0004 inch and a 0.748-inch hole having the same tolerance.

Each of the two spindles at the right bores two 0.750-inch holes with a tolerance of 0.0004 inch on the diameter. Pilot bushings are used to support the ends of the boring-bars working from the right-hand side. The axes of each set of three holes bored by the left-hand spindles and

**Fig. 12. Using Specially Designed Cutters with Inserted Carbide Teeth 1/4 Inch Wide to Straddle-mill Sides of Pendulum Body. Narrow Teeth are Required because of Close Clearance between Work and Clamps**



**Fig. 13. Boring Holes in Back Cover Assembly. The Tolerance on the Diameter of Each Hole is 0.0004 Inch, and on the Alignment of the Center Lines, 0.0005 Inch**



**Fig. 14. Lining up Bail in Early Stage of Instrument Assembly. Mercury Manometers are Used to Insure Equalization of Air Leakage at Both Ends of Swing**



each pair of holes bored by the right-hand spindles must be in alignment within a tolerance of 0.0005 inch.

One of the final assembly operations is shown in Fig. 14, where the bail and nozzle are being lined up by the aid of mercury manometers. Air pressure is applied to the instrument the same as it would be during actual operation, and adjustment is made for end play and perpendicularity with the shaft, so that the amount of air leakage will be the same at both ends of the swing.

Fig. 16 shows a row of Sperry designed machines which are lapping narrow ball-bearing raceways on the cone-shaped ends of pivots. A cast-iron roughing lap charged with diamond

dust is used first, after which a bronze lap brushed with lubricating oil is employed for finishing. The rotating spindles of these lapping machines, which also reciprocate vertically, are set to give a fixed number of lapping strokes to each pivot cone.

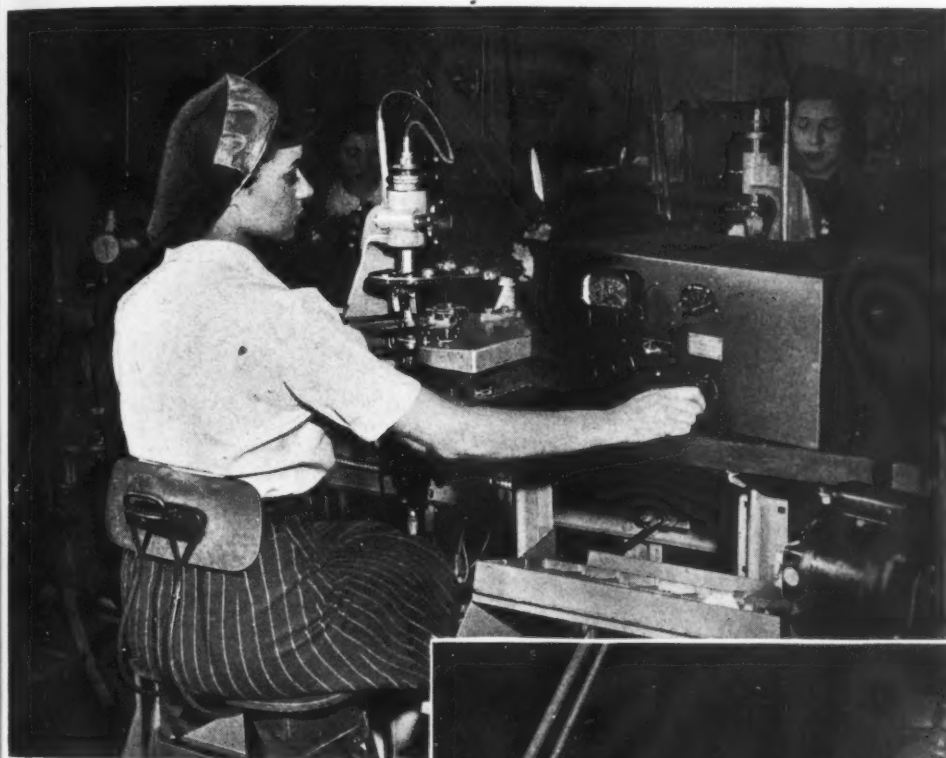
In Fig. 15, a small air rotor is shown being balanced at 10,000 R.P.M. The electronic balancing machine indicates the angular position of the heavy section of the rotor and the depth of hole that should be drilled in the side of the rotor to correct this unbalance.

The drilling machine used for this purpose is shown immediately to the left of the operator. The adjustable holder on the drilling machine

work-table has an index dial which permits the location of the rotor in the angular position called for, and a dial indicator gage governs the correct depth of drilling. An interesting feature of this drill is that the drill spindle is surrounded by a tube which is connected to a vacuum system. All of the fine drilled particles are carried out through this tube, eliminating any possibility of their adhering to the rotor and later impeding the function of the instrument in which it is installed.

"Directional Gyro" and "Gyro-Horizon" instruments are tested on Scorsby machines, which simulate the rolling, pitching, and yawing experienced in actual flight conditions. Under

these test conditions, every factor must be watched carefully. For example, several years ago it was found that minute flecks or particles were being eroded from the inside of the connecting hydraulic hose lines during testing, due to the high velocity of the oil flow. Minute as these particles were, they tended to clog in the hydraulic system. This is not surprising when it is realized that fits of 0.0005 inch were the ultimate orifices through which the oil had to pass. To provide the immaculate hydraulic system needed, plastic hose was adopted. This avoided any possibility of eroded hose particles preventing the proper operation of the sensitive mechanical elements of the system.



**Fig. 15. Testing the Rotor for Balance with Electronic Indicator. Specially Equipped Drilling Machine at Left of Operator is Used to Remove Metal in Order to Bring Rotor into Dynamic Balance**



**Fig. 16. Lapping Pivot Points of Rotor Spindles on Automatic Machines. The Spindles are Held in a Fixed Position while the Laps Rotate and also Reciprocate Vertically**

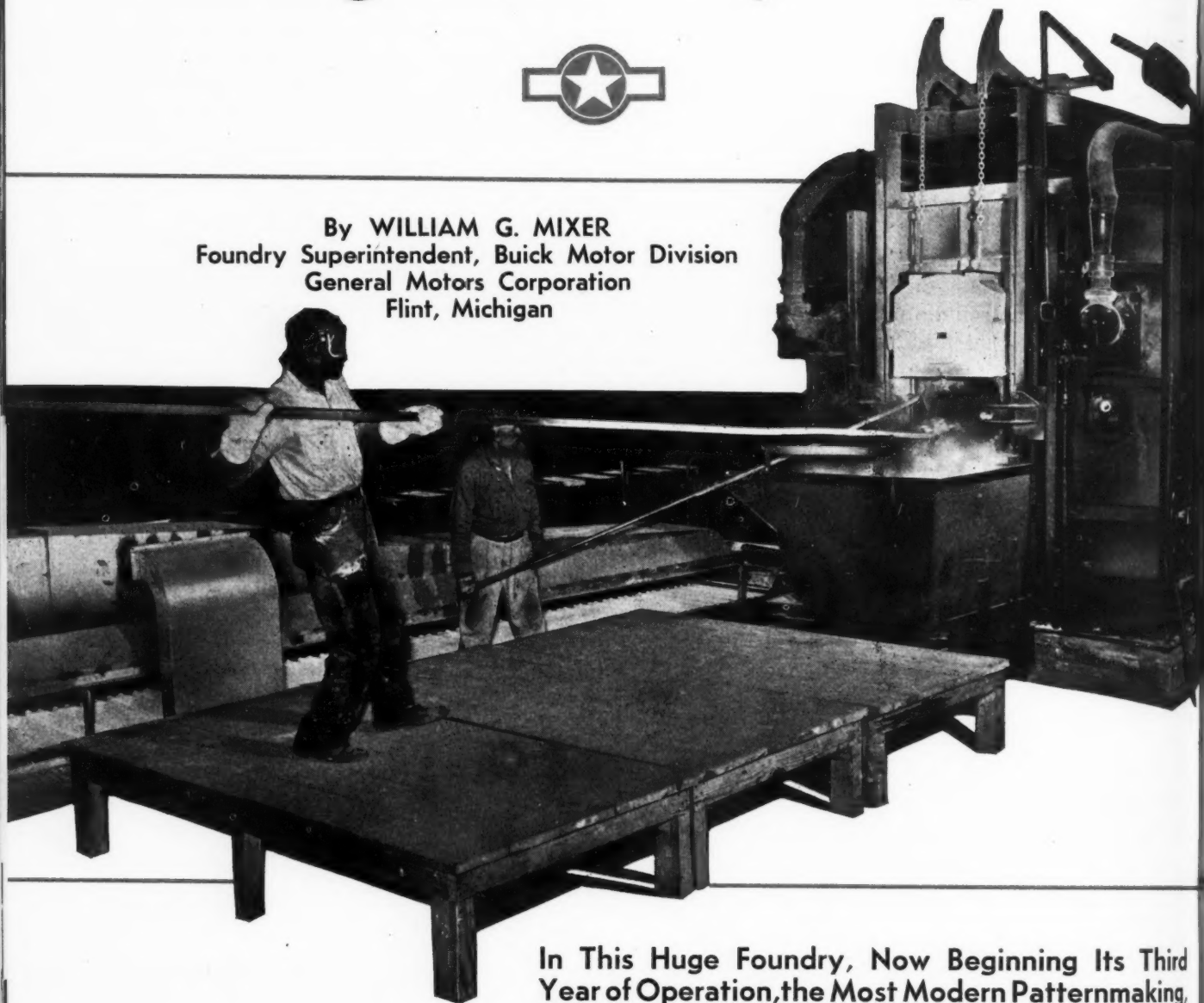




# *Casting Rolls Royce Cylinder*



By WILLIAM G. MIXER  
Foundry Superintendent, Buick Motor Division  
General Motors Corporation  
Flint, Michigan



**In This Huge Foundry, Now Beginning Its Third Year of Operation, the Most Modern Patternmaking, Molding, Melting, and Casting Practices are Employed. Designed by Buick Foundrymen, It has been a Pacemaker for Aluminum Casting Operations**

**A**BOUT two and a half years ago, Buick began the construction of a 10 1/2-acre aluminum foundry at Flint, Mich., to meet the anticipated demand for aircraft engine castings. Up to that time, the experience of our foundrymen had been almost entirely outside of the aluminum field. Perhaps because of this, we had fewer precedents to bind us in planning the details of the new plant. At any rate, in addition to incorporating much of the excellent practice which we found being employed by other companies who had been casting aluminum for many years, there were utilized a number of our own

innovations which were based on a lifetime of experience in the ferrous field.

The result was a plant with a flexible, straight-line production lay-out which represents maximum utilization of equipment and economies in both molding and casting materials.

The Buick aluminum foundry is divided into four units, each of which has practically identical equipment so that it may be operated independently or in conjunction with the other units, or shut down as the case may require. This arrangement makes for maximum flexibility and economy of operation. Each unit consists of two

# *Blocks in Buick's \$10,000,000 Aluminum Foundry*

production lines with all equipment for the straight-line flow of molds, cores, and castings.

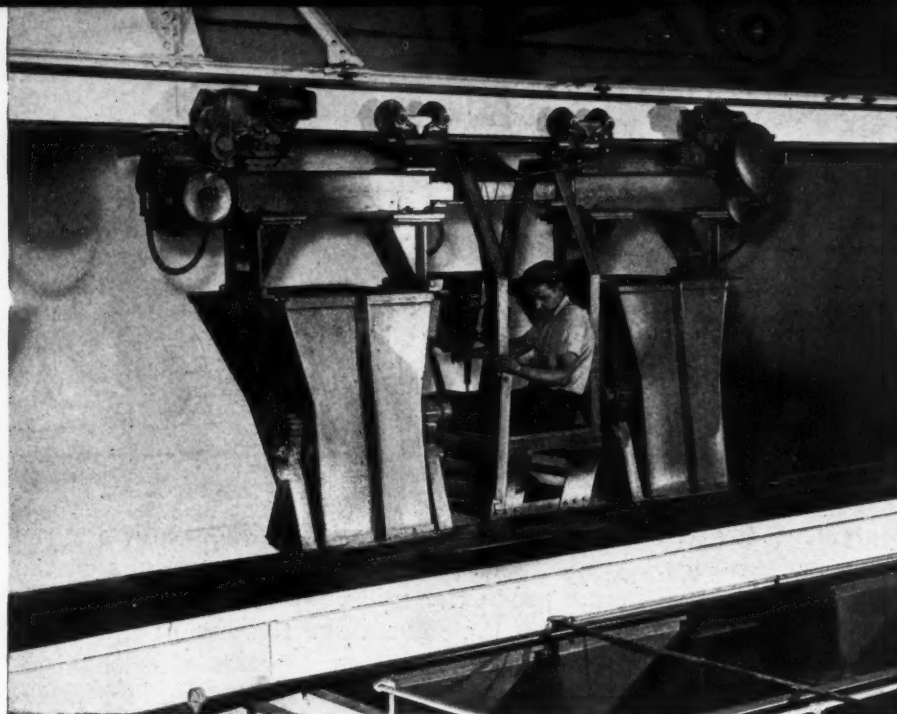
The advantage of this arrangement is shown by a recent production change. Pratt & Whitney aircraft engine cylinder heads have been moving along the production lines of this foundry ever since it started operation. During the last few months, however, Rolls Royce cylinder blocks have also been placed in production. Because of the much greater size of the Rolls Royce castings and a quite different type of construction requiring a large number of cores, the procedure for molding and pouring is somewhat different from that used in producing the Pratt & Whitney engine castings. The change-over was accomplished with a minimum of difficulty, however, since one of the production lines could be set up

especially for this new job without affecting the production of Pratt & Whitney castings on the other production units.

One of the outstanding features of this foundry is the extensive employment of mechanized equipment for the movement of raw materials and work in process. From one end of the plant, where the core sand is unloaded from freight cars and carried up into overhead bins by continuous belt conveyors, to the other, where finished castings are carried on a process conveyor to the shipping area, the employment of manpower for purely physical tasks is kept at a minimum.

In Fig. 1 is shown one of four overhead monorail conveyor cars that deliver the two kinds of sand required to the core-making benches along





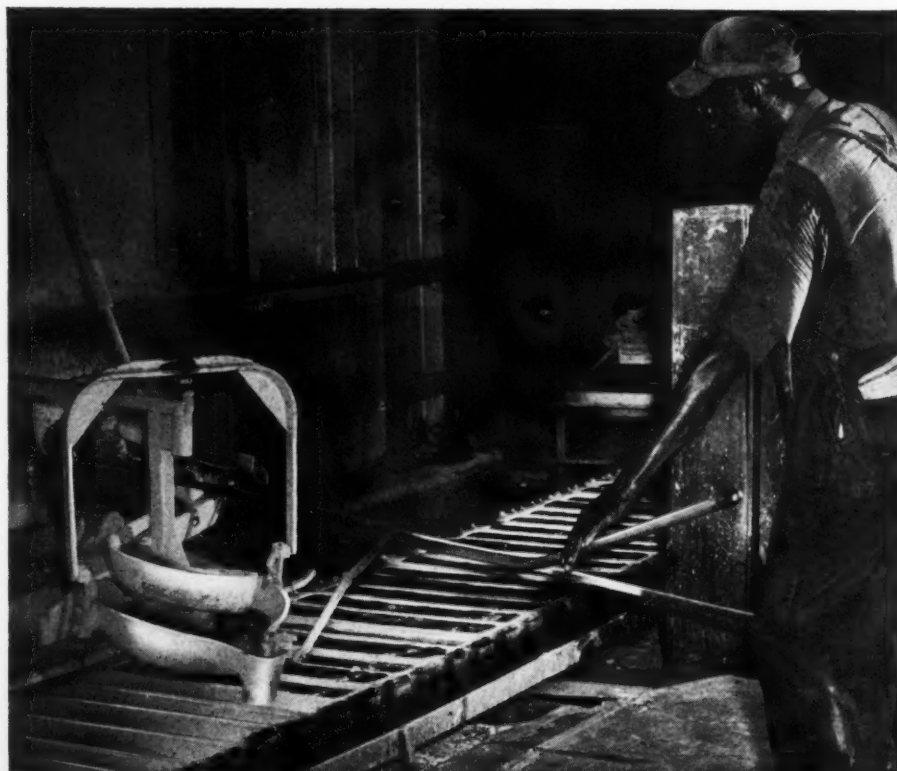
**Fig. 1. Monorail Conveyor for Loading Storage Hoppers of Core-making Machines. Four Such Conveyors Serve Sixteen Production Lines**

both sides of the eight production units. Sand from the two mixing rooms can be carried quickly along one of the sixteen tracks to any point over the benches, where it is rapidly discharged into the supply bins that feed the core machines. Some 128 machines can be kept in adequate supply by the use of these four monorail conveyors.

Belts move under each core baking furnace to catch any loose sand. Sweepings along the molding aisles pass down through gratings to a collector belt that delivers the material to reclaiming equipment located in the basement of the plant. About 98 per cent of the sand used is reclaimed, the only loss being that which is taken up by the dust collecting system. This combina-

tion of sand collection and dust disposal leaves the foundry floor almost as clean as that in one of the newly built aircraft factories.

In Fig. 2 is shown molten aluminum from one of the 20,000-pound Dempsey furnaces being poured into ingot molds, which are arranged on an endless conveyor. Of interest is the pouring ladle, which receives metal from the furnace spout in such a way that turbulence and the resulting inclusion of air which might form oxides and porosity are kept to a minimum. The ingot molds are designed with fins underneath to promote rapid cooling. The design of both the pouring ladle and the ingot molds were innovations introduced by Buick foundrymen. In addition, hooded fans are located above and below the in-



**Fig. 2. Pouring Molten Aluminum into Ingot Molds. Buick-designed Pouring Ladle Minimizes Turbulence and Air Inclusion. Finned Molds Hasten Cooling**





**Fig. 3. Electrical Contactor Arrangement for Profile Milling. Signal Light is on when Stylus is in Contact with Contour Plate**



got mold conveyor line to aid in the cooling. During cold weather, the heat taken away by these fans is used to warm other parts of the building.

The pattern shop is large and well equipped with both woodworking and metal-working machinery. An ingenious device used in the pattern shop to permit the profile milling of metal patterns on a regular vertical milling machine when the special profile milling machines are engaged in more exacting work is shown in Fig. 3.

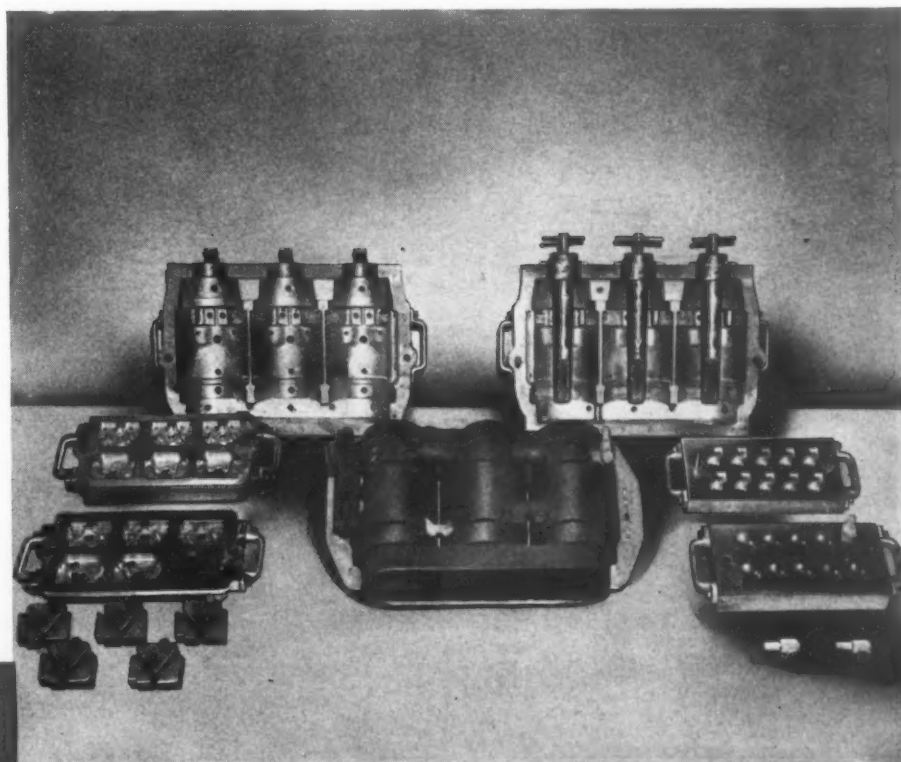
A small low-voltage indicating light is connected through a bell type transformer to the regular power supply. Connected in the circuit is a stylus, which is in vertical alignment with a profile guide plate held in position at the rear of the work-table. As the cutter is fed down-

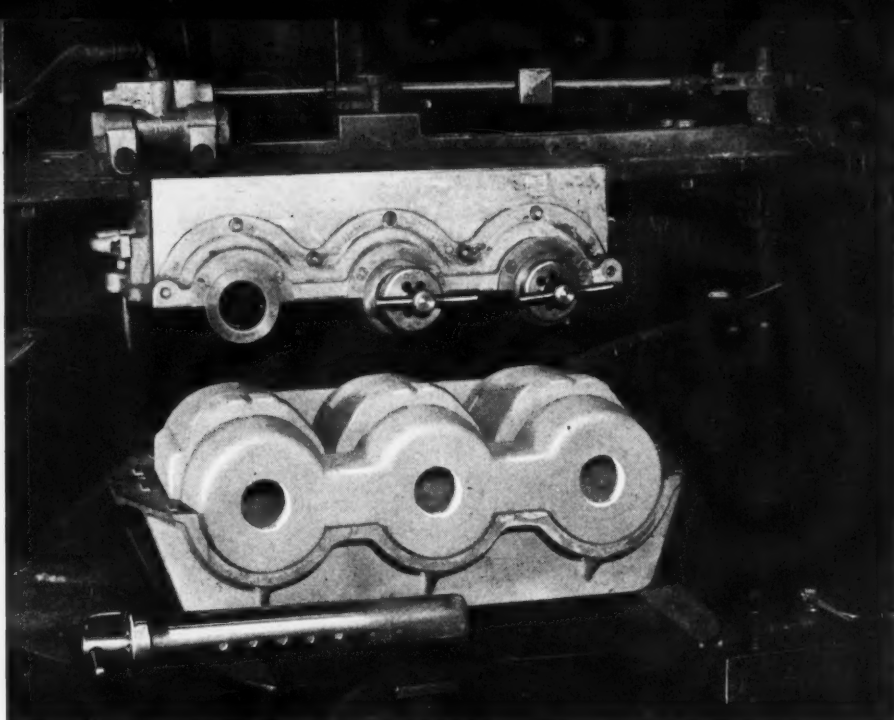
ward, this vertical stylus approaches the profile guide plate, and when it makes contact with it, the indicator lights.

A skillful operator can manipulate the horizontal and vertical traverse wheels of the milling machine in such a way that the milling cutter moves along the casting in a series of small steps, so that the stylus is never out of contact with the profile plate for more than an instant and the light is kept continuously blinking. Using this device, it is possible to obtain a contour which is within a tolerance of 0.008 inch.

Some idea of the intricacy of the Rolls Royce cylinder block casting can be gained from the core-boxes and cores shown in Fig. 4. These and many other intricate core-boxes are made in this

**Fig. 4. Examples of Core-boxes and Cores Required for a Rolls Royce Cylinder Block Casting. Complete Assembly of a Barrel Core is Shown in Center**





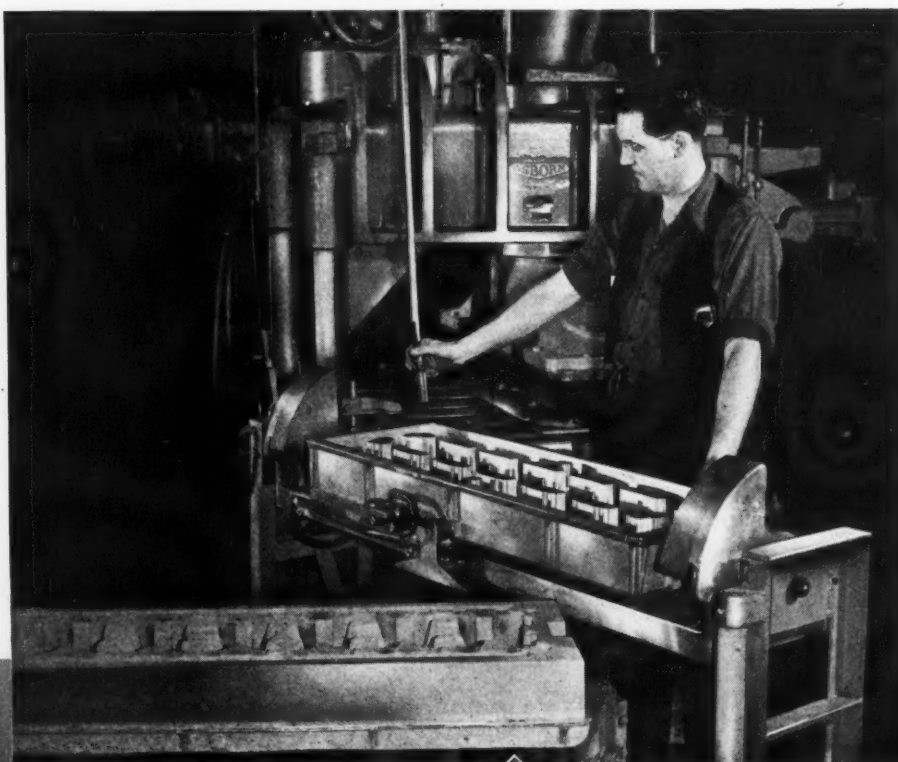
*Fig. 5. Barrel Core Immediately after Blowing in Core Blowing Machine. Two Pins that Form Cavities are in Position for New Core. Third is Shown in Front*

pattern shop. An assembly of barrel cores and small cores for water passages is shown in the center of the illustration. The small cores, such as those shown in front of the core-boxes, are molded and baked separately and are then set in place with core paste. In Fig. 5, a barrel core is shown immediately after having been blown into the mold on an Osborn core blowing machine. Two of the tapered pins that form cavities in the barrel cores are shown in the position they would occupy if the two halves of the core-box were fitted together ready for blowing. The third pin is shown in front of the lower half of the core-box.

In addition to thirty-two cores, the mold consists of six separate pieces—top, bottom, sides, and ends, each of which must be made up sepa-

ately. In Fig. 6, a mold section is shown after it has been drawn in a Buick roll-over draw machine. The empty core-box has just been turned upright from the draw position and is being blown out preparatory to reinsertion under the blower ram. This machine has a hydraulic control which can be precisely regulated for a slow and even draw. The mold section shown forms the bottom of the completed mold. The top, side, and end sections, together with the barrel cores, are shown on a conveyor leaving the baking furnace in the heading illustration on page 163.

The assembled molds are shown in Fig. 7, ready for pouring. It will be noted that the sides and ends of each mold are held in place by an angle-iron frame, while two straps attached to



*Fig. 6. Bottom Section of Mold Proper in Fore-ground. Mold Box is being Blown out for Reinsertion under Ram in Molding Machine*



**Fig. 7. Pouring Aluminum into Assembled Molds. Mold is Made up of Separate Bottom, End, Side, and Top Sections, with Gate on Top and Barrel Cores Inside**



the frame hold the top section of the mold tightly on top of the sides and ends. No flask is employed. The use of standard jigs and pattern plates throughout the molding operation insures that each core and part of the mold will fit exactly into place. The pouring ladle itself is preheated to a specified temperature.

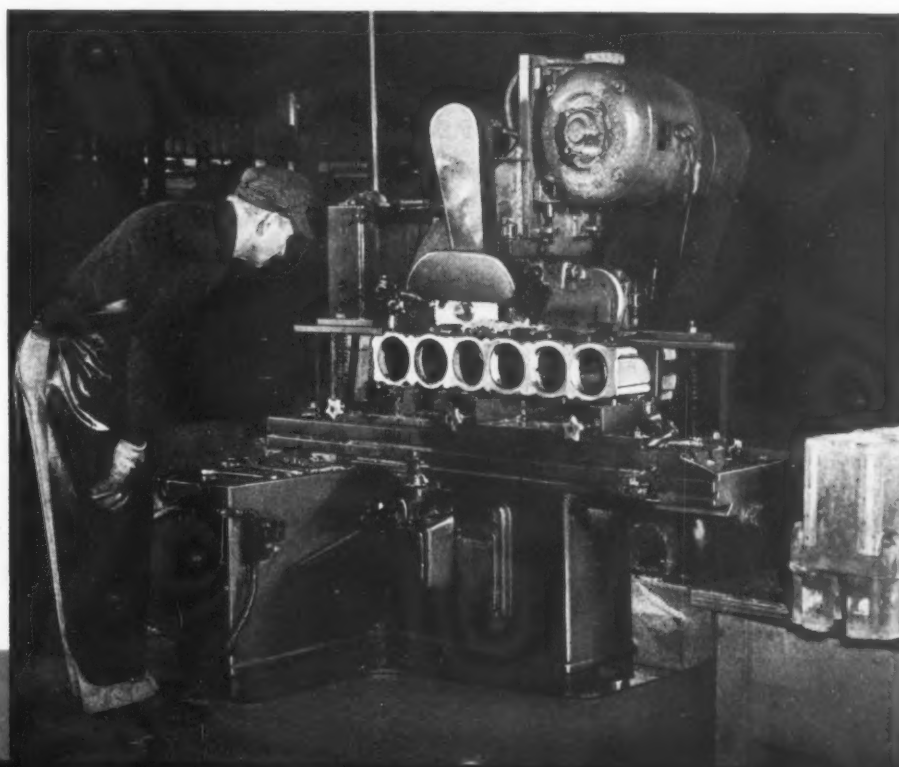
In each of the four production units, there are twelve 1000-pound capacity Fisher oil-fired furnaces in which the metal is heated for pouring. About one-half new metal and one-half remelted metal are used. It may be mentioned here that practically 100 per cent of the scrap, such as gates and risers, less normal melting loss, is salvaged for remelting. Remelt furnaces similar to that shown in the heading illustration on page 162 and ingot casting equipment are located at

both sides of the foundry, so that the trucking of scrap is kept to a minimum.

After the casting has cooled, the mold assembly is taken to a shakeout machine, where the mold is broken open, the casting is removed, and the sand mold sections and cores are carried down a chute to crushing machines, which pulverize them in the first step of the sand reclamation process.

As shown at the right in Fig. 8, the casting, as taken from the mold, has numerous large risers extending along its entire length. The removal of these risers presented a difficult problem. The customary band saw method was inadequate. A specially designed Atkins aluminum cutting saw was finally rigged up on the automatic milling machine shown. With a table feed of 18 inches

**Fig. 8. An Aluminum Cutting Saw Removes Heavy Risers Seen on Casting at Right on an Automatic Milling Machine in Two Passes**



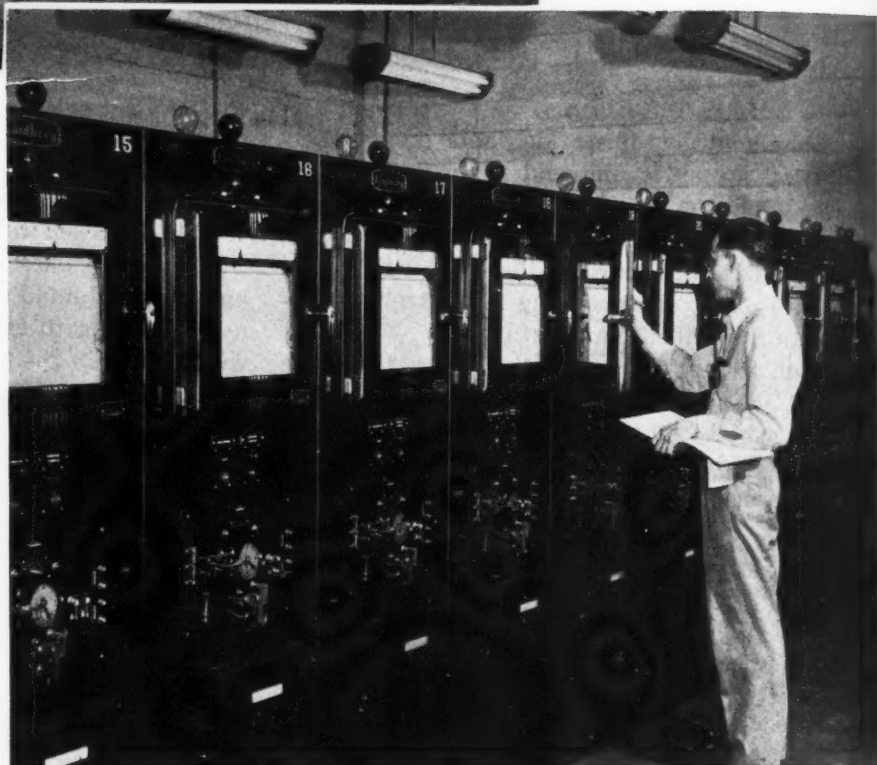




*Fig. 9. Batch of Rolls Royce Cylinder Block Castings on Rack Used during Heat-treating Operations*



*Fig. 10. Section of Central Control Panel for Twenty-eight Heat-treating Furnaces. Each Furnace is Preset for Time and Temperature, and All are under Control of One Man*



per minute and a surface speed of 2450 feet per minute for the saw, the risers are cut off from a casting in two quick passes.

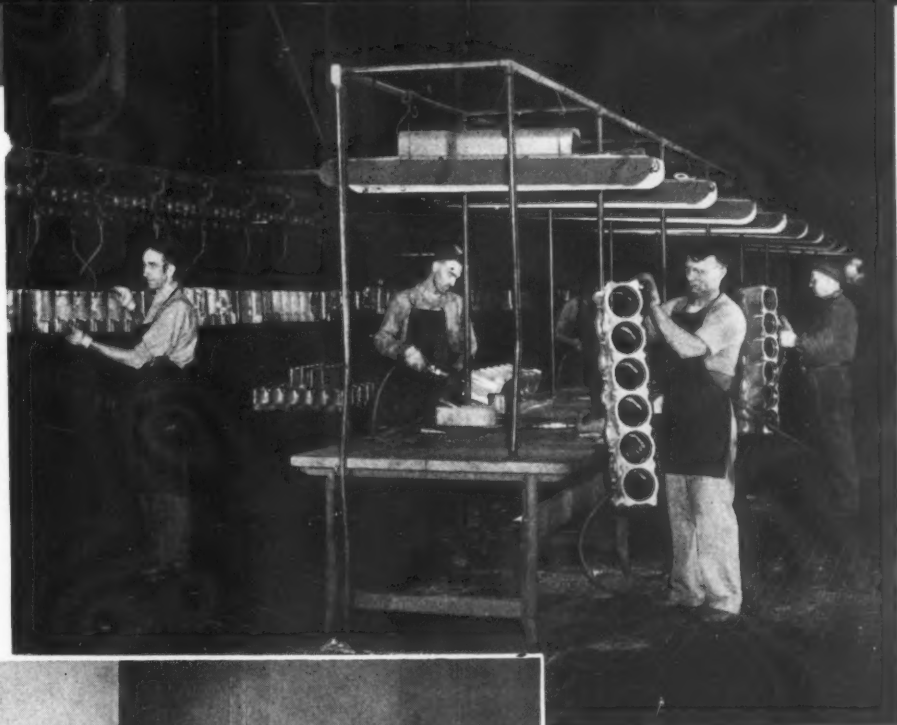
Fig. 9 shows a number of Rolls Royce cylinder block castings on a rack used during the heat-treating or normalizing operations. After being loaded on this rack, the castings are placed in one of the twenty-eight Lindberg furnaces used for heat-treating in this foundry and are given a 5 1/2-hour normalizing heat-treat. All the heat-treating furnaces are controlled from a central panel, which is located in the office section of the foundry.

This control panel, shown in Fig. 10, includes temperature recording and adjusting instru-

ments and time control instruments. The length of the heat-treating period for each furnace can be preset by means of the automatic timing device shown in the center of each panel. When the end of the heat-treating period for a particular furnace is reached, the heating units are automatically shut off and a signal light is flashed beside the furnace, indicating to the workman in charge that the castings are ready to be removed. Thus, the control of temperature and time for all the heat-treating furnaces is under the immediate direction of one man.

After completion of the heat-treating operation, the rack holding the castings is lifted out of the furnace and is cooled at room tempera-

**Fig. 11. Rolls-Royce Castings Passing down Clean-up Line for Final Inspection and Touching Up**



**Fig. 12. A Check is Made of All Aluminum Heats by the Spectrographic Analysis of Sample Disk Castings. Many Other Tests are Made to Insure Uniformity of Physical and Chemical Properties**

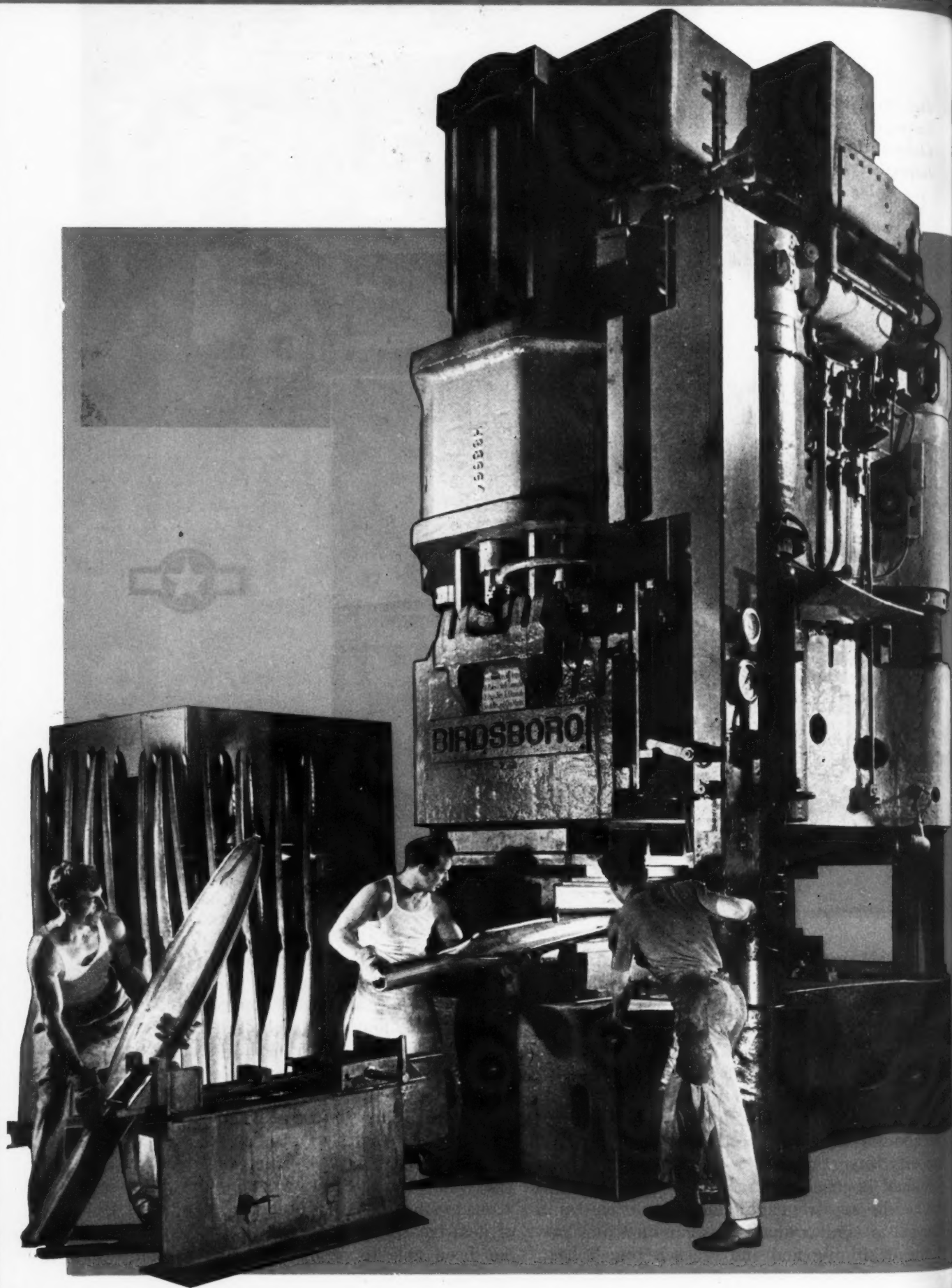
ture. The castings are then given a final inspection, and any rough spots are touched up on the "clean up" line shown in Fig. 11.

Elaborate and exact control of all materials used in both molding and casting is maintained. A sample of each type of sand is taken every four hours and tested for permeability, green strength, moisture, and fineness. Core oils are checked for tensile strength, gas evolution, and viscosity.

A disk is cast from each casting heat and is checked by spectrographic analysis, as shown in Fig. 12. A similar analysis is run on a disk cast at the beginning and end of each remelt heat. Chemical analyses are carried on continuously

as a spot check on the spectrographic analysis of the aluminum alloy.

Four test bars are taken from each 1000-pound casting heat, and one is checked for diameter, hardness, and tensile strength. If this bar does not meet the required specifications, another is tested. In case none of the four test bars meet the specification requirements, a test bar is cut from a casting of that heat and subjected to a tensile strength test. Periodically, sections are cut from castings and examined under the microscope to study structural inclusions and the effect of heat-treating. With these safeguards, Buick has been able to produce remarkably uniform castings and rejections have been minimized.





# Forming and Welding Curtiss Hollow Steel Propeller Blades

Many Interesting Features of the Press Working and Welding of Hollow Steel Propeller Blades, which Aircraft Designers in Other Countries have Declared were Impractical, are Described in This Article

By HOLBROOK L. HORTON

**E**VER since World War I, there has been a search for a more suitable material than wood from which propeller blades could be made. Aluminum alloy was one answer; steel was another. But whereas aluminum alloy was light enough to permit the manufacture of a solid propeller blade, steel was much too heavy. If steel were to be used, the only solution to the weight problem seemed to be in the fabrication of a blade that was hollow.

The difficulties in producing a hollow steel blade at first appeared insurmountable. Nevertheless, experimental work was begun, and gradually this paved the way for improvements in milling, welding, forming, inspection, and testing. These improvements in manufacturing methods, in turn, made it possible to produce hollow steel blades that have proved their practicability and are now being used on American combat aircraft all over the world.

These blades are light in weight. They have superior resistance against erosion, and because of their greater strength, they are less easily damaged, not only in combat, but also in take-offs and landings, which often must be made under the most severe conditions.

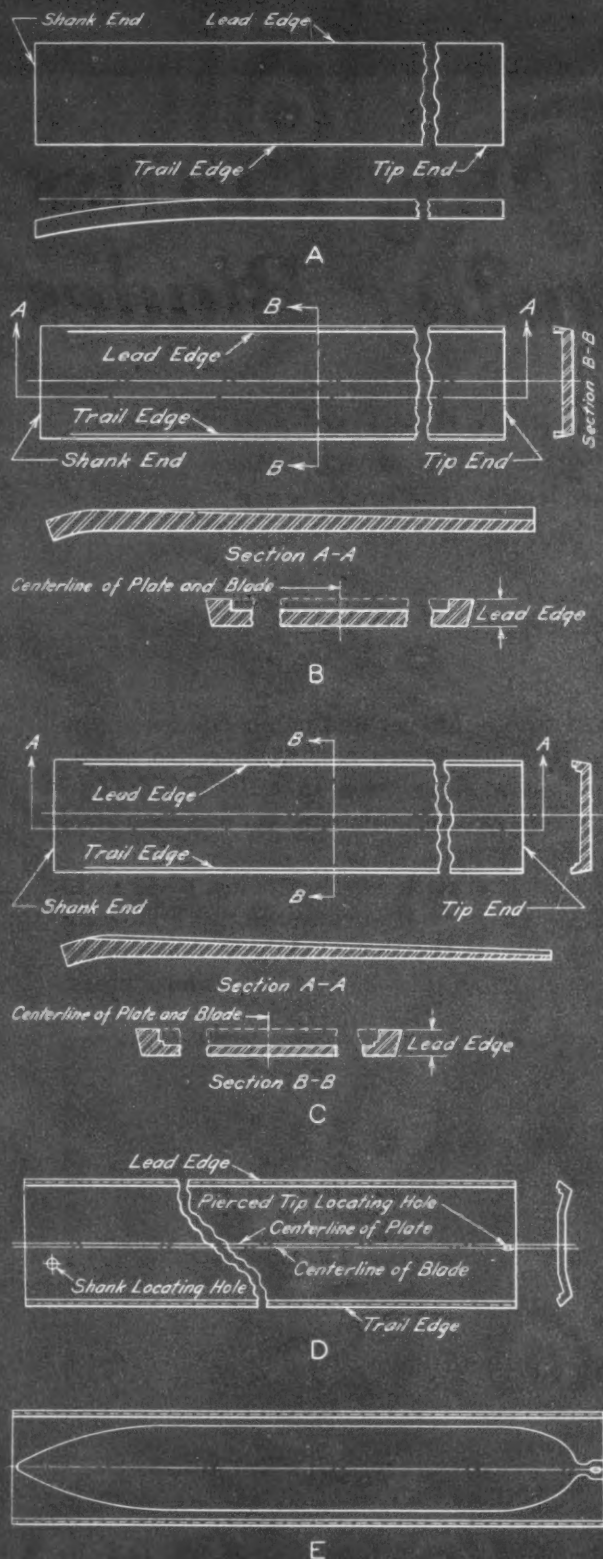
To achieve in a fabricated hollow structure the complex curvature and delicate balance of a propeller blade requires many unusual welding and forming operations. This article will describe the interesting features of these operations.

Curtiss blades are constructed of two plates of chromium-nickel-molybdenum steel. These plates are received from the mills in blanks of the approximate length, width, and thickness

required for the thrust and camber sides of the blades. The blanks are now taper-rolled at the steel mills—an innovation that has resulted in a 50 per cent saving in the amount of rough steel originally required.

The first operation on the thrust plate is to mill the edges at a 15-degree angle. Following this, one side of the thrust plate is face-milled, and then it goes to a 300-ton Birdsboro press,





**Fig. 1. Initial Thrust-plate Forming and Machining Operations.** (A) First Breakdown Gives Lateral Curvature; (B) First Milling Produces Tapered Contour; (C) Second Milling Forms Stepped Edge Contour; (D) Lengthwise Breakdown Prepares Plate for Final Milling; (E) Diagram Indicating Contour of Blank to be Cut from Thrust Plate

where an operation called the "breakdown" imparts a slight curvature to the shank end, as shown in Fig. 1 at A. The thrust plate is then taken to a Cincinnati Hydromatic milling machine, where it is rough taper-milled, as shown at B. In the succeeding operation on the same type of machine, an even cut, which is slightly narrower than the previous cut, is milled along the entire length, resulting in a stepped cross-section, as shown at C.

The thrust plate then goes to a 2000-ton Birdsboro press, where it is bent lengthwise, under a pressure of 1400 tons for five seconds, to the contour shown in the end view at D. This is in preparation for finish-milling. A locating hole is also pierced in the tip end for subsequent forming operations. The plate is then finish-milled to remove the inside step shown at each side of the front view at D, and to provide a flat surface almost entirely across the top side of the plate between the two unmilled edges.

It is then blanked to the contour shown at E on a 2000-ton Birdsboro press. The plate is located by a plug which enters the die guide hole at the shank end and a pin which engages the tip slot. Following this operation, the plate is press formed to get the proper curvature and twist at various stations along the blade.

Turning now to the camber plate, the first two operations are edge-milling and face-milling, similar to those described for the thrust plate. After these operations, the camber plate is broken down on a 300-ton Birdsboro press to the contour shown in Fig. 2 at A. Then follows a rough taper-milling operation on a Cincinnati Hydromatic milling machine to produce the contour shown in the end view at B. After two additional rough-milling operations, the camber plate is broken down to the cross-sectional contour shown at C for finish-milling, and a locating hole is pierced in the tip end.

The camber plate is then blanked to the contour shown at D. That part of the plate from the shank end to the beginning of the blade proper is now formed on a 300-ton Birdsboro press (Fig. 3) to the contour shown at E, Fig. 2, after being heated to a temperature of 110 to 150 degrees F. with an acetylene torch to prevent cracking.

A second forming operation is conducted on a 2000-ton Birdsboro press, preliminary to the final forming of the entire contour of the camber plate. Previous to this forming operation, the plate is placed in a heating cabinet and its temperature is raised to from 100 to 150 degrees F.



to prevent cracking. Following this operation, the plate is given a stress relief for two hours in a car type gas furnace, and is then cooled in still air.

Scale is removed from these plates after the various hot-forming and heat-treating operations by the Bullard-Dunn process, as shown in Fig. 4, where blades that are nearing completion are being cleaned. A series of tanks is arranged in a circular position, and rotating dip racks are used to raise, lower, and move the shells from tank to tank. The transfer of plates from one tank to the next is automatic, and takes place at preset intervals of about three minutes and forty seconds.

The work is first immersed in an acid bath, and is subjected to an electric current for anodic cleaning. It next passes to an alkali bath, which is also subjected to an electric current. A hot water rinse and a cold water dip complete the cleaning process.

After cleaning, the camber plate is ground and polished on the lead and trail edge turnovers with an air grinder. It is now painted with graphite solution for the third forming operation along the sides of the shank and edges of the blade, which are bent at sharper angles on a 2000-ton Birdsboro press.

For the fourth and final forming operation, a mandrel is placed in the end of the shank and two side mandrels are used farther up the shank, as shown in Fig. 5. The resulting contour and cross-section of the camber-plate shell are now as shown at A in Fig. 7. After removal of scale by the Bullard-Dunn process, the trail and lead edges of the blade proper are milled to a flat surface, as shown at B.

The camber and thrust plates are now ready to be matched for assembly. For each propeller blade, a camber and thrust plate are selected which, together, are within the required weight and balance limits.

Filler welds are then placed on both the lead and trail edges inside the turned-over section of the camber plate near the shank end, at about the point where the shank end of the thrust plate fits in. These welds provide support for the turned-over sections and are produced with a General Electric atomic hydrogen welding unit. After welding, this section of the camber shell is covered with sand and allowed to cool for about an hour and a half.

Following a shot-blast and grinding of these filler beads to gage, the camber and thrust plates are ready for actual assembly. The camber shell

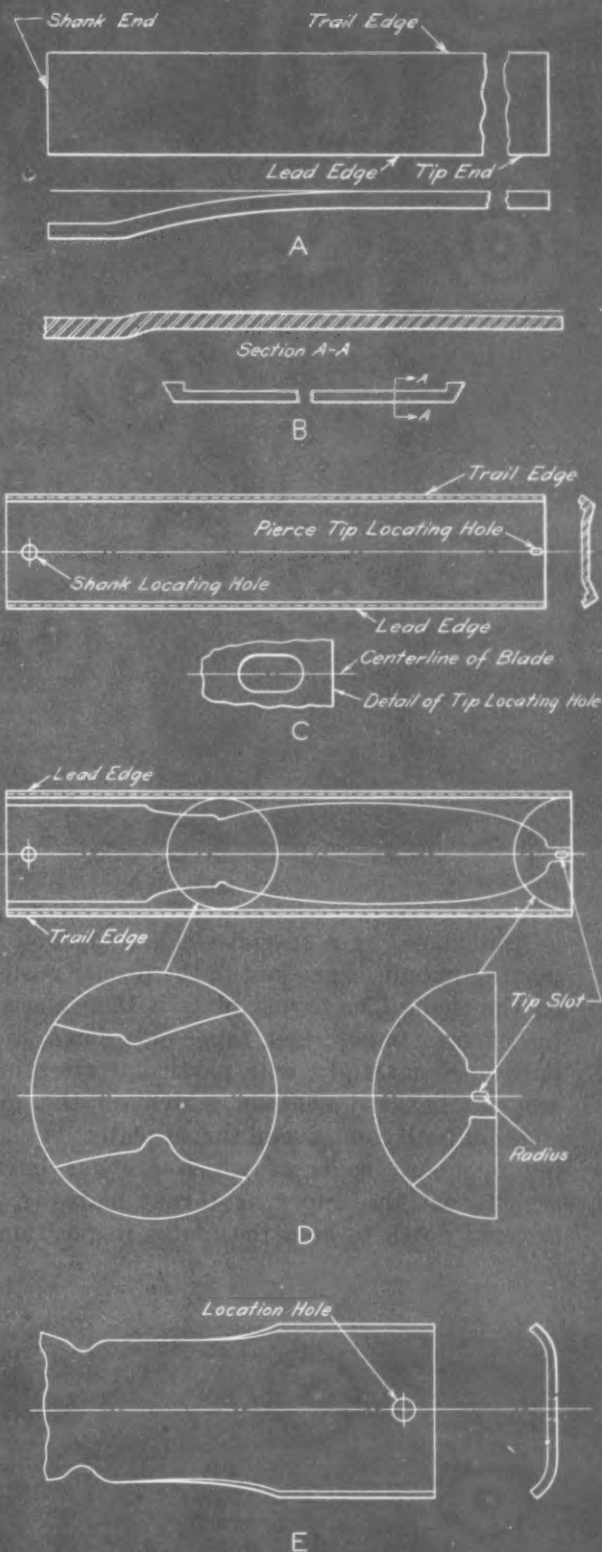


Fig. 2. Initial Operations on the Camber Plate. (A) First Breakdown Imparts Lengthwise Curvature; (B) First Milling Produces Taper; (C) Second Breakdown Produces Lateral Cross-section Shown in Preparation for Final Milling; (D) Contour of Blank to be Cut from Plate; (E) Lead and Trail Edges near Shank End are Curved by Press Forming





is first placed in a special welding jig and supporting mandrels are laid in the proper positions on the shell. The thrust plate is then placed on top of the camber shell, taper side down, and is positioned carefully, with particular attention to securing a good contour match on the inside edges of both camber and thrust plates. A clamping member, inside of which are gas burners which heat the upper or thrust plate, is then brought down to hold the plates in position, as

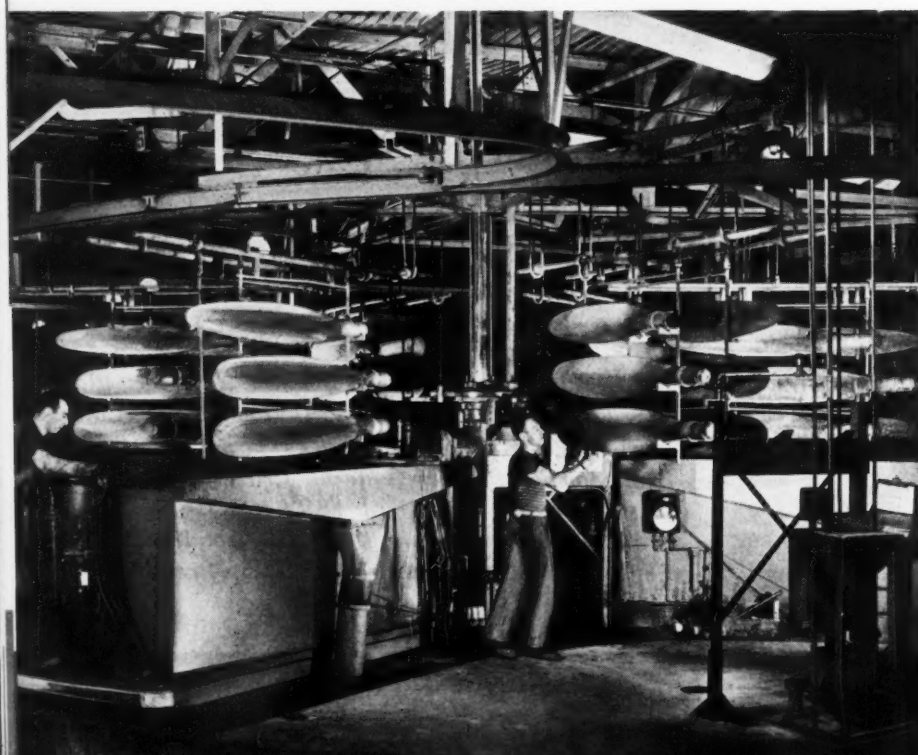
shown in Fig. 6. This arrangement serves to keep the two plates in exact alignment and prevents their warping and buckling during the welding operation.

The lower or camber plate is preheated by gas burners under the jig. The temperature of both plates is raised to several hundred degrees F., and this temperature is checked with "Tempilstik," a compound that melts when a specified temperature is attained. The trail and lead edges are simultaneously welded by workmen on opposite sides of the jig, using General Electric atomic hydrogen welding units.

Before the completion of the welding in this jig, the trail-edge turnover is heated to a dull red, and is hammered down to get the desired gap and contour. The last 10 inches of the tip is heated with the neutral flame of an acetylene torch, and both lead and trail edges are hammered down with a flatter.

The blade is now removed from the jig, and the "Y" near the shank end, where the end of the thrust plate fits into the camber plate, is welded by the atomic hydrogen process in preparation for the shank weld.

The welding of the shank, shown in Fig. 8, is conducted by the Unionmelt process in a most ingenious manner. A muslin bag, about three-fourths filled with Unionmelt compound, is inserted in the shank after a closed section of asbestos fire hose is laid in a flattened position on the bottom inner surface. The fire hose is then inflated, which presses the bag of Unionmelt compound tightly against the inside of the joint to be welded. As the welding progresses, the bag



*Fig. 3. (Above) Shank End of the Camber Plate is Given the First Forming on a 300-ton Hydraulic Press*



*Fig. 4. (Left) Descaling and Cleaning of Blades after Various Hot-forming and Heat-treating Operations are Quickly Accomplished in This Automatically Timed Cleaning Machine*

**Fig. 5. The Edges and Shank of the Camber Plate are Curved around Mandrels in This Hydraulic Press Operation**



disintegrates, but the inflated asbestos hose continues to hold the welding compound against the inside of the weld. This operation, formerly done by hand-welding in one hour, now requires only three minutes.

When the welding is completed, the shank is covered with a minimum of 1 inch of mica, and the opening of the shank is also sealed with mica, so that the heated metal will cool evenly and without distortion.

After cooling, the blade is stress-relieved in an electric pit furnace. Following this, the shank is cut off with a Racine power saw, and any scale formed during the stress relief is removed by the Bullard-Dunn process previously mentioned. Both lead and trail edges are then snag-ground.

Next the shank is heated in a Tocco induction heating machine (Fig. 10), and is then swaged in a National forging machine to reduce it to the desired diameter, as shown in Fig. 13. After the swaging operations have been performed, the shank is placed in mica and cooled.

The operation that follows is a ticklish one. It calls for the brazing of the inside seam of the blade along the shank end. The section of the blade to be welded is heated externally by inserting it in a gas furnace, as seen in Fig. 11. As shown, the tip end of the blade is held in an air chuck support. A copper fillet is brazed inside the shank end, as shown in Fig. 9, using a water-cooled acetylene torch. The use of an inside copper fillet relieves any surface stresses

**Fig. 6. The Thrust and Camber Plates are Held in Exact Alignment by a Special Jig, which also Preheats the Plates before Welding. Lead and Trail Edges are Welded by the Atomic Hydrogen Process**



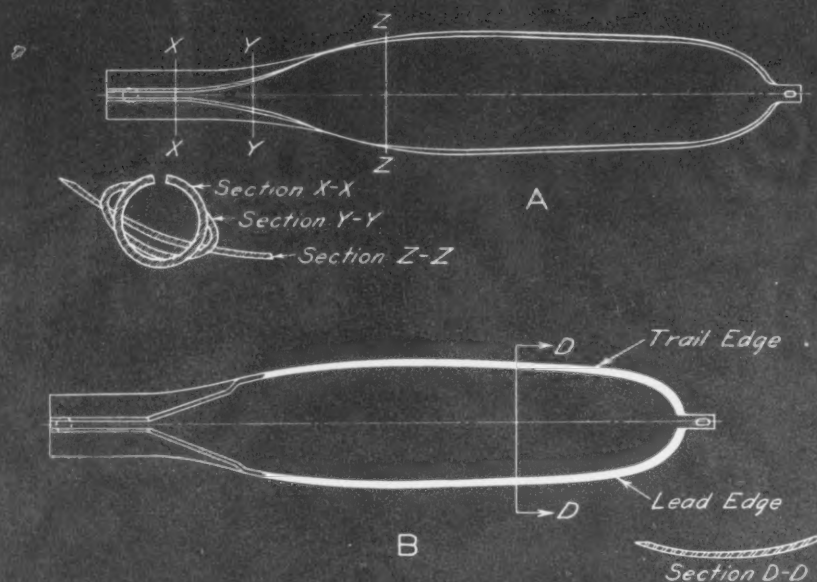


Fig. 7. (A) Cross-sectional Contours Produced by the Forming Operation Shown in Fig. 5; (B) Trail and Lead Edges of the Camber Plate are Milled to Flat Surfaces

which might arise if these seams were not filled with a ductile material.

After removal of scale in the Bullard-Dunn machine, the seams of the blade are inspected visually and by X-ray. A rather ingenious arrangement has been devised to permit continuous X-raying of these blades. As shown in Fig. 12, a three-sided turntable was designed to hold two blades on each side. While one set of blades is being unloaded on one side, a second set can be unloaded on another, and a third set can be X-rayed inside a lead-lined X-ray chamber.

In addition to detecting blow-holes or defects in the weld, another reason for X-raying the blades is to reveal any excess copper which may

have melted and adhered to the inside surface of the blade away from the brazed seam. Such a small piece of copper might become loosened during the rotation of the blade in service, and by shifting its position, throw out the delicate balance of the propeller as a whole.

Following this inspection, a ring is welded around the shank end of the blade, which is later used to position the shank in the forging machine for upsetting. As shown in Fig. 14, this operation is performed on a Unionmelt welding machine, and takes about twenty minutes, compared with 1 3/4 hours for the former method of welding by hand. The ring and that part of the shank adjacent to it are then normalized by being heated and allowed to cool for twenty-five

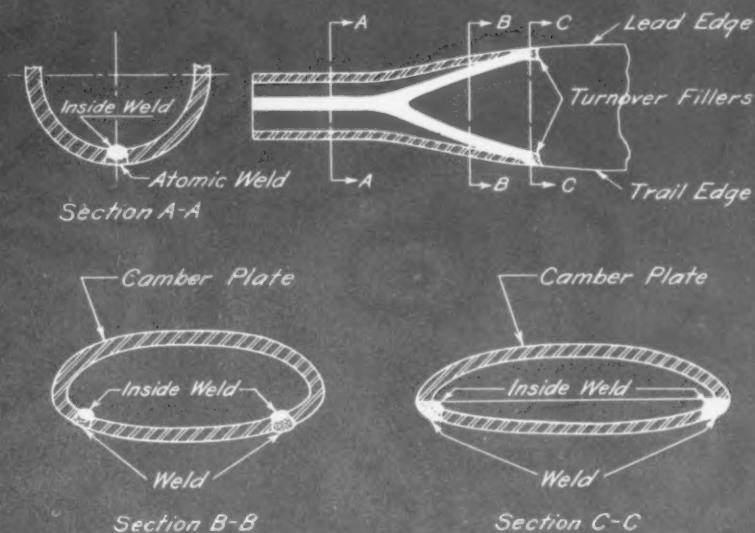


Fig. 8. After Welding of Trail and Lead Edges, Shank Seam is Welded by Unionmelt Process





**Fig. 9. Location of Copper Fillets which are Brazed inside of the Shank End of the Propeller Blade to Relieve Any Surface Stresses which May Occur during Operation**



minutes while the blade is rotated very slowly about its own axis. After the ring has been turned to the proper diameter, the shank is given a final cut-off on a Racine power saw.

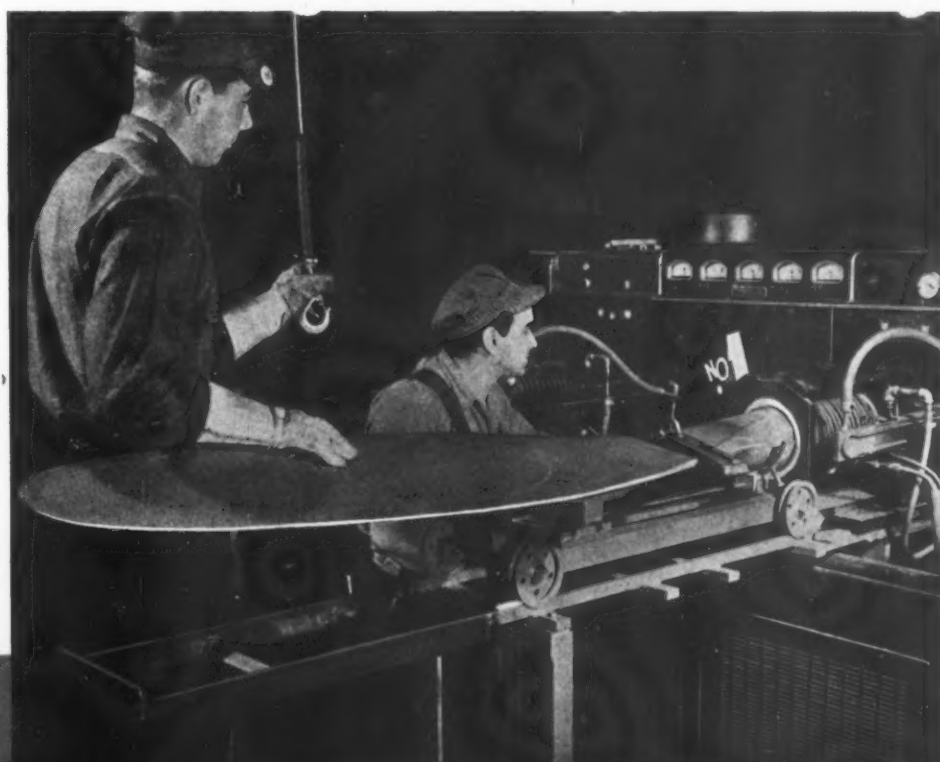
The shank of the blade is now heated in a Tocco Junior induction heater. It is of interest to note that, when heated by gas, thirty to sixty minutes was required to bring it up to the desired temperature, whereas with the present method, this is accomplished in 2 1/2 minutes. Following heating, the shank is upset on a National forging machine in three passes (Fig. 15) to the cross-section shown in Fig. 16. It is then covered with mica and allowed to cool slowly for four hours.

The profile and lead edges of the blade are now ground, and after Magnafluxing, the blade is

pickled in preparation for brazing the remainder of the interior seams. After being preheated with steam for three or four minutes, the blade is filled with an Oakite solution and is allowed to stand for twenty minutes. It is then rinsed with water and air-dried with a blower.

Following this cleaning, the blade is preheated in a gas furnace. As shown in Fig. 17, the shank end of the blade is supported by a carriage which moves the blade slowly in an edgewise position through the furnace to heat the blade section evenly along its entire length. A combination of two sizes of copper wire is applied to the seam of the lower edge of the blade, and the braze is started about 1 1/2 inches from the tip of the thrust blade and continued down the trail edge.

**Fig. 10. Induction Heating of Shank of Propeller Blade in Preparation for Swaging to the Desired Diameter**



*Fig. 11. Inside of the Seams Close to Shank are Brazed, Using an Oxy-acetylene Torch*



Brazing is done entirely by the heat from the furnace. A gas atmosphere is supplied to the interior of the blade during the brazing operation. Following this operation, the brazed area is allowed to cool slowly in order to prevent cracking. The position of the blade is now reversed, so that the lead edge is down, and this is then brazed.

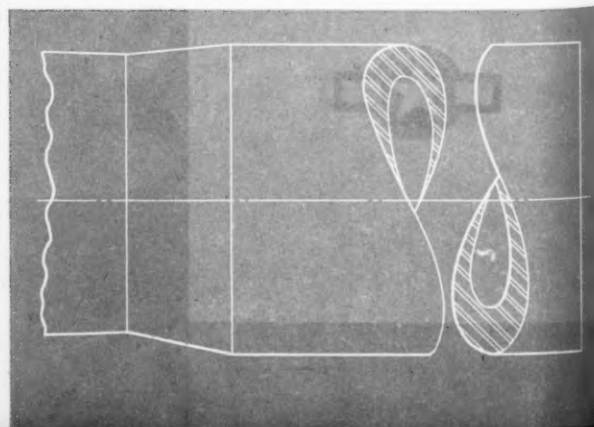
Scale is now removed once more by the Bullard-Dunn process and the brazed seams are

X-rayed. Following this, the blade is normalized in a small pit furnace for one hour and is then cooled in a rotating cooler pit.

A most interesting and unique operation now follows. The blade is placed in a rotating pit furnace, where it is heated for a certain period of time, which is automatically controlled. Fig. 18 shows a heated blade which has just been removed from one of the chambers of the pit furnace. The blade is quickly placed in a

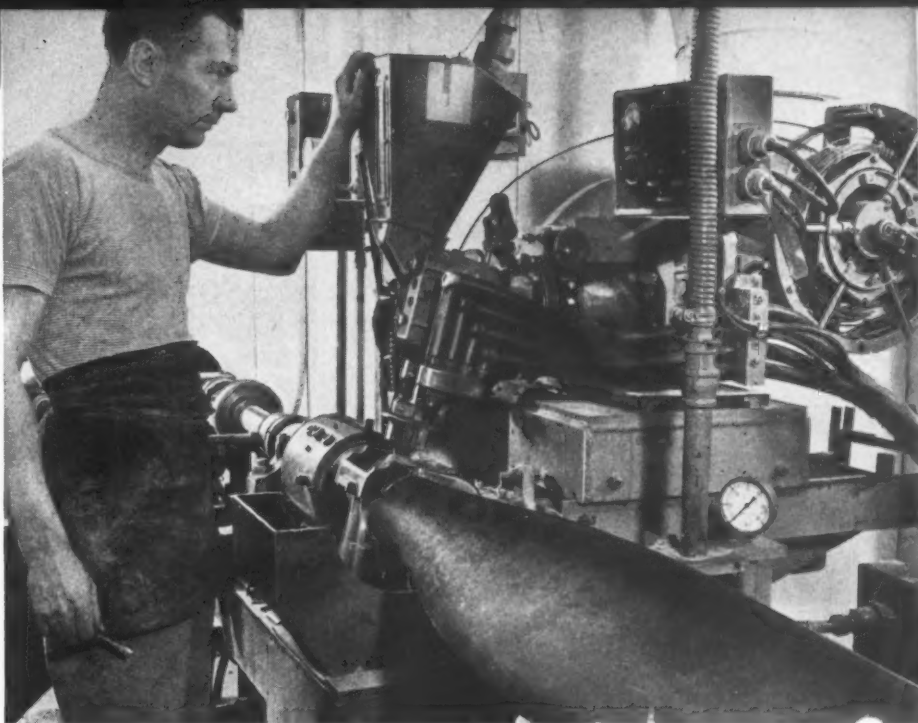
*Fig. 12. (Left) Ingenious Triangular Turntable Permits Loading and Unloading of Blades on Two Sides while the Blades on the Third Side are being X-rayed inside a Lead-lined Chamber*

*Fig. 13. (Below) Diagram Showing the Contour of the Propeller Blade Shank after It has been Swaged to Bring It to the Desired Diameter*



## PROPELLER BLADES

**Fig. 14. Locating Ring for Upsetting Operation is Welded in Place by Unionmelt Process**



1300-ton Birdsboro press, as shown in Fig. 19. The breech-block shown at the left of the blade shank is closed over the open end and the ram of the press brought down to exert its full capacity on the exterior of the blade.

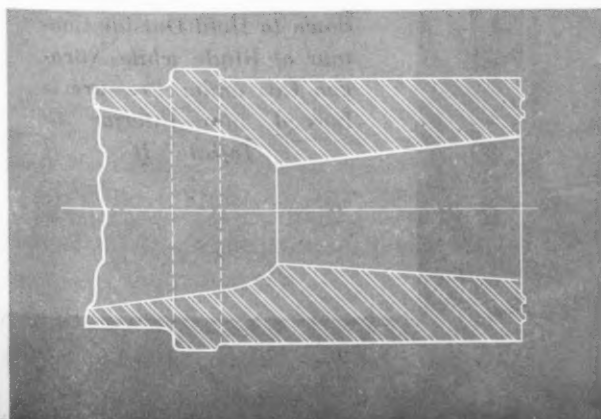
Then nitrogen gas under pressure is applied through the breech-block inside the blade and serves to inflate it to the desired curvature. After the gas pressure has been applied for about two minutes, the blade is subjected to a water

spray quench while still in the press, and this quickly cools it to around 70 to 90 degrees F. Following this operation, the dimensions of the blade are checked and it is placed in an electric pit furnace to be drawn to proper hardness.

Then follow various machining operations on the hub, finishing operations, such as the grinding of the blade surfaces, and the balancing of the blade. The final product is indeed a tribute to American engineering resourcefulness.

**Fig. 15. (Right) The Shank End of the Propeller Blade is Upset in Three Passes in the Forging Machine Here Illustrated, which Brings the Cross-section to the Shape Shown in Fig. 16**

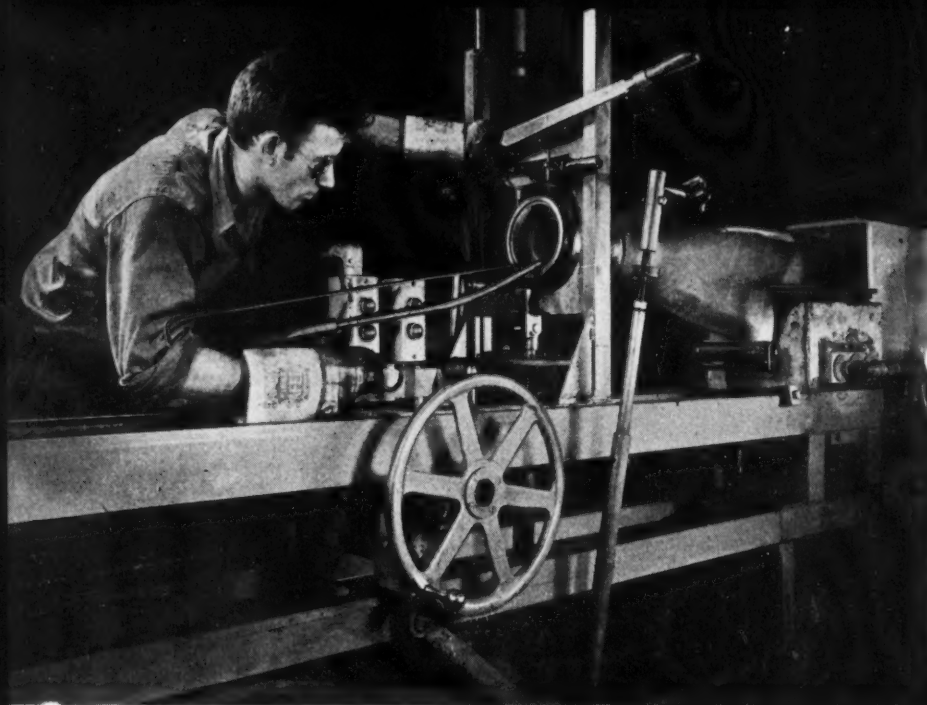
**Fig. 16. (Below) Cross-section of the Propeller Blade Shank after Upsetting Operations have been Performed in Machine Shown in Fig. 15**



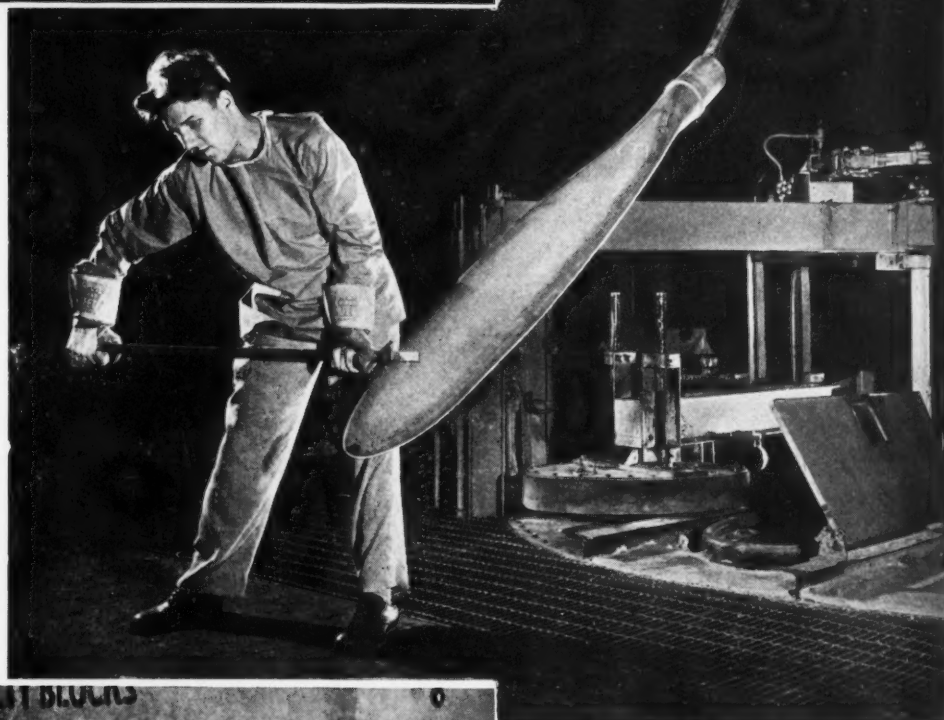


## PROPELLER BLADES

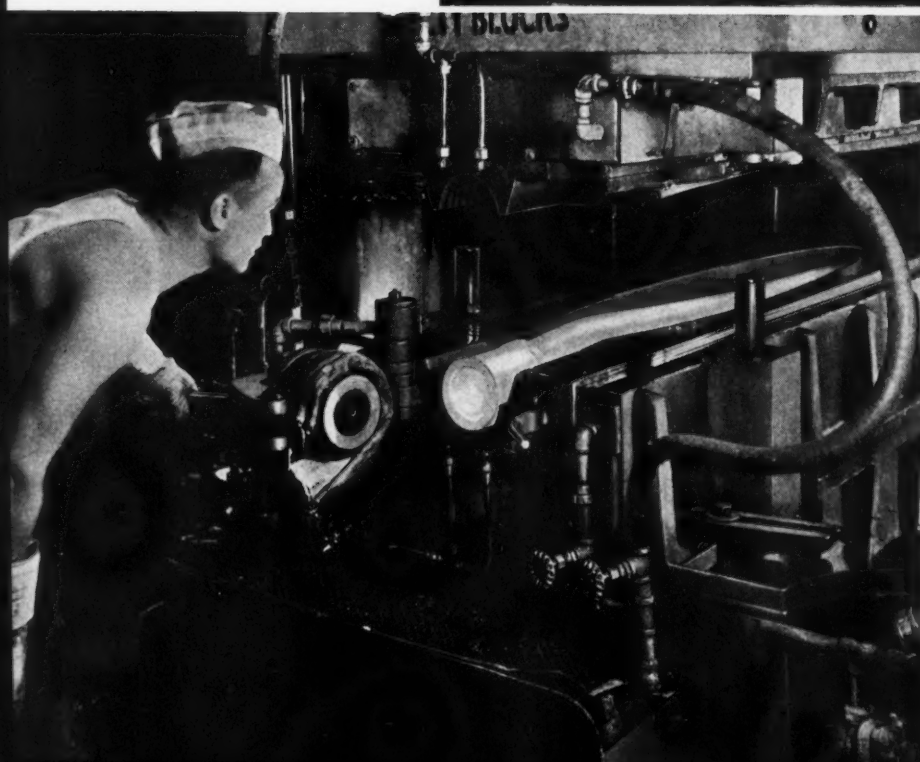
*Fig. 17. (Left) Brazing Inside of Blade Edge Seams, Using Externally Applied Heat and Maintaining Gas Atmosphere inside Blade*



*Fig. 18. (Right) Removing White-hot Blade from Pit Furnace Preparatory to "Inflating" It*



*Fig. 19. (Left) White-hot Blade in Hydraulic Press with Breech-block Ready to be Closed over Shank Opening. Press Ram Comes down to Hold Outside Contour of Blade while Nitrogen Gas under Pressure is Forced into Interior to "Inflate" It*



# Engineering News

## Magnetic Brake Stops 16,000-R.P.M. Motor Within Six Revolutions

A magnetic brake that will stop a 1/8-H.P. motor traveling at 16,000 R.P.M. in less than six revolutions has been developed by Chester I. Hall of the General Electric Co. The new brake is not yet commercially available, but it is expected to find wide use after the war. The outside of the moving part of the motor travels at 62 miles an hour. When stopped within six turns, it is actually stopped in a distance of 2.73 feet while traveling at the rate of over a mile a minute.

## Wafer-Thin Rubber Replaces Wood in Storage Batteries

A wafer-thin rubber is now replacing wood in the manufacture of storage batteries, according to information obtained from the United States Rubber Co., Rockefeller Center, New York City. This thin rubber is used as a plate separator and makes possible, for the first time, the shipment of batteries to all battlefronts in fully charged condition, but without the acid and water heretofore necessary to insure the electrical charge, as well as the life of the battery. Post-war possibilities of this development include the making of large shipments of batteries to distribution points without the previous weekly recharge formerly necessary.

## Speeding up Airplane Riveting with a Hydraulic Press

A revolutionary development in airplane fabrication has been made at one of the Ford Motor Co.'s plants. Fin bulkhead spars are now being riveted by using a 500-ton hydraulic press. In a single operation, two spars with 270 rivets are completed. The total time consumed by press riveting is five minutes for each spar. Hand-

riveting, formerly employed, required twenty-five minutes per spar. Furthermore, press riveting eliminates warpage and provides uniform strength. Hand-riveting was never completely satisfactory because of warpage and uneven strength.

## Fibrous Glass Insulation Used for 18,000-H.P. Motor

Primarily because of its resistance to corona and high temperatures, fibrous glass insulation is used to a large extent in the construction of the 18,000-H.P. motor built by the Westinghouse Electric & Mfg. Co. for the Boeing Aircraft Co.'s wind tunnel which is installed in the Edmund T. Allen Memorial Aeronautical Laboratories in Seattle, Wash.

Glass is employed as a covering for the strands within the conductors, subdividing the conductors in such a manner as to control the eddy losses. It is also used as the outside binder for all phase and lead connections and for a high-temperature binder for the coil, where, because of the resistance of fibrous glass to corona attack, it also serves as a base for semi-conducting treatment for the elimination of corona.



By Making Both Bearing and Journal of Lucite, It is Possible for This Westinghouse Engineer to Inspect Visually Various Bearing Designs and to Study What Goes on Inside a Bearing. Oil Colored with Red Pigment is Introduced into the Bearing and the Effectiveness of the Lubrication is Immediately Apparent

# Editorial Comment

We hear a great deal about the duty of industry to provide employment in the post-war era. From much that is said, one might almost think that the managers of industry can provide

## *The Real Employer of Labor is the Consumer*

or withhold employment at will. There is so much loose thinking on this subject that the mind of the public in general, as well as of those engaged in industry, is very much confused.

True enough, men who have the courage, initiative, and ability to engage in an industrial enterprise are creators of jobs for those who do not have such enterprise or ability but are capable of working when employed and directed by someone else. However, a manufacturer provides jobs in this manner for the purpose of producing goods that the public in general, including the men and women who work for him, want and need in their daily life. Hence the ultimate employer is the buyer and user of the goods that are produced.

If there are no buyers, the manufacturer cannot go on indefinitely employing people to produce that for which there is no demand. He is an intermediary who employs and directs men to produce certain articles in an efficient manner, so that they may, in turn, be sold at a reasonable price. In so doing, he performs a double service

## *Those Who Create Jobs Ought Not to be Hampered*

—through his enterprise he provides jobs for people unable to create jobs for themselves, and he also provides means for producing goods for people who are not able to produce those goods for themselves.

To place upon industrial enterprise the entire responsibility for providing employment is, however, unreasonable. Employment is provided by the ability of the entire community to buy and consume the goods produced. If the community is prosperous, obviously there will be a greater demand for goods. The manufacturer who makes them can sell more goods, and in so doing, he can employ more people in making them.

Hence the first duty of Government is to take scrupulous care that all laws passed and all Governmental regulations tend toward the prosperity of the community—the prosperity of those

who create jobs, as well as of those who fill the jobs. If those who create jobs are hampered, they will be unable to expand their businesses so as to employ more people; and if the people at large who fill the jobs are prevented by restrictions or by excessive taxation from working, earning, and accumulating to the best of their ability, they will be unable to buy the goods the making of which would provide employment.

In this connection, it is well to observe that there is only one means by which people at large can become prosperous—that is, by working to the best of their ability to produce as much as they can of the useful goods that they themselves

## *Without Hard Work There Can be No Prosperity*

require for their happiness and well-being. Extremely short hours and restrictions on output make for national poverty, not for prosperity.

Furthermore, it is not the manufacturer who suffers most through the inefficient use of labor; the worker himself is the chief loser.

The manufacturer can frequently recuperate through increased prices, even though this means a smaller volume of sales; but the workers suffer through their inability to acquire the things for their comfort and well-being that they would have been able to have if their working ability had been used to the best advantage. In a community where people are willing to work efficiently at fair wages, there is not likely to be much unemployment.



We will not attain economic security and progress merely by inventing a new political formula or by trying to use political devices that have proved to be unsuccessful, nor by making plans for the distribution of wealth or income, but only by increasing our production and our investment and our savings, and by working harder and more cooperatively, and by improving our policies and methods of government. Independent planning by Government agencies, by business men individually and as a group, and by the leaders of organized labor is necessary, but eventually there must be a coordination of plans and a determination by all groups to make them work.—Stevenson, Jordan & Harrison, Inc.



# Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers  
as Typical Examples Applicable in the Construction of  
Automatic Machines and Other Devices

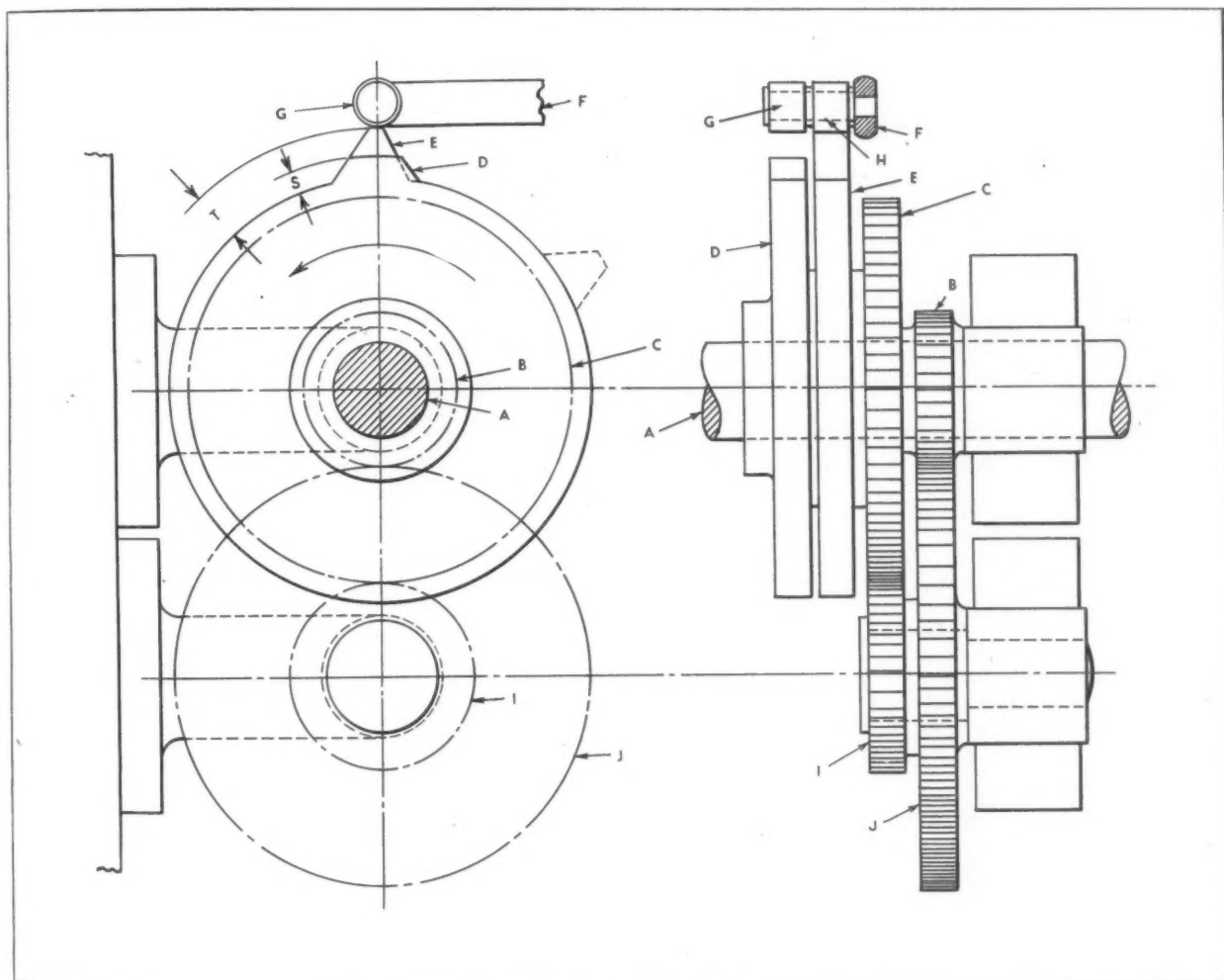
## Mechanism for Obtaining Variable Intermittent Oscillating Movement

By L. KASPER

The mechanism shown in the accompanying illustration was designed to impart an oscillating movement of magnitude, or height, *S* to roll *G* of lever *F* on a wire-forming machine at each revolution of the driving shaft *A*. The mechanism is so designed that the magnitude, or height, of every sixth oscillation is approximately twice

that of the five preceding oscillations, as indicated by the dimension *T*.

The required movement is accomplished in a restricted space by means of two cams *D* and *E*. The drive-shaft *A*, rotating in the direction indicated by the arrow, carries the gear *B* and cam *D*, both of which are keyed to shaft *A*. Gear *B* meshes with gear *J*, which is keyed to gear *I*, both rotating freely on a stud. Gear *I* meshes with gear *C*, which is keyed to cam *E*. Both gear *C* and cam *E* rotate freely on shaft *A*. Lever *F* carries a stud on which the two rollers



Mechanism by Means of which Shaft *A* Imparts an Intermittent Oscillating Movement to Lever *F* of Magnitude *T* Every Sixth Revolution of Shaft *A* and of Magnitude *S* at the Intermediate Revolutions

*G* and *H* rotate freely and independently of each other. Cams *D* and *E* are of the same size and outline, but it will be noted that cam *E* provides a lift *T* which is practically twice the lift *S* of cam *D*.

When the mechanism is in operation, cam *D* rotates with shaft *A*, transmitting motion to lever *F* through roller *G*. Gear *B* transmits rotative motion to cam *E* through gears *J*, *I*, and *C*, cam *E* transmitting motion to lever *F* through roller *H*. As the gear train consisting of gears *B*, *J*, *I*, and *C* is in the ratio of 6:1 with respect to the speed of shaft *A*, cam *E* acts on roller *H* once in six turns of shaft *A*.

Thus, lever *F* is given five oscillating movements by cam *D* followed by an oscillation of greater magnitude imparted by cam *E* on the sixth turn of shaft *A*. On the following fifth turn, or revolution, of shaft *A*, cam *E* arrives at the position shown by the dotted outline. On completion of the sixth rotation of shaft *A*, the position of cam *E* is that shown by the full outline, with the cam roller *G* raised to its highest position.

### Mechanism for Changing Position and Length of Slide Stroke

The mechanism here illustrated is designed to permit limited adjustment of the length and position of the reciprocating stroke transmitted to slide *J* by the oscillating shaft *A*. The arm *B* keyed to shaft *A* oscillates through an angle of 40 degrees, transmitting a reciprocating motion to slide *J* through links *D* and *H* which are connected by a pin *E* carried in a dovetail slide in sub-base *G*.

With the adjustment shown, slide *J* has a reciprocating stroke of 5 3/4 inches. The stroke of slide *J* can be lengthened by rotating base *K* clockwise about boss *S*, which is accurately fitted in a recess in the machine table.

Sub-base *G* always remains at right angles to base *K*, but can be adjusted along this base by a screw operated by handle *N*. Moving or adjusting sub-base *G* away from the handwheel along base *K* serves to move slide *J* to the left in its guide ways without changing the length of stroke, whereas adjusting the sub-base *G* toward handle *N* moves slide *J* to the right. Thus the position of slide *J* at

the end of its stroke to the right or to the left can be accurately adjusted.

Base *K* is clamped in place after adjustment and while the machine is stopped. Changing the position of the stroke by means of handle *N* without changing the length of stroke can be accomplished while the machine is running. The graduated collar *C* is provided to facilitate accurate adjustment of the stroke position.

### Machine Tool Orders Increasing

Shipments of machine tools for May—the last month for which complete statistics are available—totaled \$41,712,000, or at an annual rate of almost \$500,000,000. As a result of the recent new military programs, there has been a considerable increase in the demand for machine tools. The net new orders—that is, total orders less cancellations—for May considerably exceeded shipments, being valued at close to \$60,000,000, an increase of 8.3 per cent over the April total. This is at an annual rate of \$720,000,000.

The backlog of unfilled orders at the end of May amounted to \$186,340,000, an increase of 11.4 per cent over the April backlog. At the May rate of shipments, the May backlog represents four and one half months work for the machine tool industry.

\* \* \*

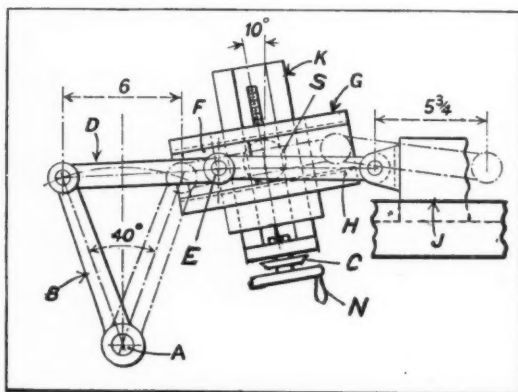
### Post-War Railroad Operation

Ralph Budd, president of the Chicago, Burlington & Quincy Railroad, has proposed a three-point program to meet the post-war railroad situation. He outlines his program as follows:

1. A tax reform which would permit deduction from taxable income of maintenance funds set aside and earmarked for future use.
2. Freight rates that would recognize the value

of property devoted to public use without regard to market value of securities, which in many cases have been shrunk in reorganization.

3. Equal treatment of all public carriers through elimination of subsidies, which artificially over-expand the country's transportation plant—necessitating its operation with inadequate traffic, and placing a burden on unsubsidized carriers and the public.



Mechanism Designed to Permit Adjustment of Position and Length of Slide Stroke

# Grinding Fluids Deserve Careful Study

By W. H. OLDACRE, President and General Manager  
D. A. Stuart Oil Co., Chicago, Ill.

SOME sort of grinding fluid has almost always been necessary in precision production grinding. As precision has been improved and the rate of stock removal increased, the function of the grinding fluid has assumed greater importance and has attracted more and more attention.

Water mixtures were in almost universal use as grinding fluids until comparatively recent years. Assuming that the important functions of the fluid were to cool the work and catch and flush the fine chips, so as to remove them from the atmosphere and from the working parts of the machine, it was easily concluded that water, plus some sort of rust-inhibiting agent, was the ideal grinding fluid. Thus it has been customary to lightly dismiss the grinding fluid as a "coolant" without regard to other possible important functions. In view of the tax-free use of such coolants, while lubricants are taxed, it behooves us to approach the subject with care.

Thread grinding, with its carefully balanced high-velocity wheels, first created a demand for grinding fluids other than the usual emulsions. It was discovered that the use of certain oils in place of the emulsions gave better finish on the work and greater life to the formed wheel. The grinding of the threads of taps had previously demonstrated the advantages of oils. Today, a large number of machines turning out a wide variety of precise products are using oil as the grinding fluid; and eminently satisfactory performance indicates that such oils are here to stay.

## *Brief Review of Grinding Fluids*

It may be well to review briefly present-day knowledge of the properties and functions of grinding fluids. The soluble, or more accurately, the emulsifiable oils commonly used are emulsions of oil in water. They are, in the emulsified form, what may be termed three-phase systems, with oil in the inner phase, soaps as the protective phase, and dilute soap or salt solutions in the outer phase. Such systems normally are governed in their behavior by the outer phase, so that it is safe to assume that they will have many of the qualities of water, which is the principal component of this phase. Water is a powerful coolant, and these emulsions are good coolants—below the boiling point of water!

At temperatures above that point, a foam blanket effectively insulates the hot spot, and

the cooling effect is destroyed. Thus steel quenched in a soluble-oil emulsion will come out dead soft. For this reason, the point of contact between the work and the wheel is hotter and the body of the work is cooler when using emulsions than when using oil. This contrast frequently results in heat checks or cracks.

It is probable that in actual use the emulsion breaks down, and some lubricating benefit accrues from the oils that constitute the inner phase of the emulsion. These may be straight petroleum, straight fats, or treated oils, or mixtures of these. Certainly the composition of this inner phase affects the performance of the emulsion in many cases. Sometimes free oil carried in the emulsion will produce desirable results not obtainable in other ways. Grinding experience, in this respect, parallels experience with cutting oils, and the performance of straight oils on thread grinding and precision work confirms this parallel.

## *Chip Formation in Grinding*

A grinding wheel is obviously a multi-point cutter in which dull points are automatically replaced by the controlled breakdown of the wheel. The depth of cut and amount of metal removed by each point are minute, but the large number of points and the high speed of their travel compensate for this. Certainly the metal is removed as chips similar in form, although on a much smaller scale, to those developed in conventional metal turning or cutting. Some grinding chips recently examined, where 500 magnifications were necessary to show their structure, revealed that the chip formation was perfect. It would seem, therefore, that there is a definite similarity between grinding and cutting in so far as the chip formation is concerned.

The effect of temperature on the plasticity of metals cannot be questioned, and it is probable that plasticity plays an important part in chip formation. "Balanced plasticity" is apparently an important factor in both the grinding and the machining of metals, and this balance is governed by temperature regulation. Such regulation may be effected by the control either of heat generation or dissipation. It should be noted that in the case of hard materials, increased temperatures may result in improved plastic properties, while in the case of softer materials the reverse is true.



Another factor that has a definite effect on plasticity is velocity. Inasmuch as the rate of plastic flow of a given metal is fixed for any temperature, increased tool velocity will make the material act stiffer. It is well known that increased wheel velocity makes the wheel act harder. The action is very complex and affects both the wheel and the work.

When metals flow plastically, there is certain to be friction at high pressures and temperatures. The value of a lubricating and anti-weld action under such conditions cannot be disregarded, although it is difficult to substantiate. Practical experience definitely indicates the effectiveness of sulphurized anti-weld agents, as well as the high lubricating value to be found in fats, chlorinated oils, and other materials of this kind.

In grinding, the balance between grit size, bond strength, wheel velocity, wheel feed, work metal ductility, hardness, and toughness, and the anti-weld, lubricity, and temperature regulating properties of the grinding fluid is exceedingly delicate and complex, and it cannot be formulated in simple terms. For guidance, we

must rely on careful observation and analysis, and we must get rid of some well established but ill founded ideas concerning "coolants and lubricants."

Further, we must appreciate the intricacy of the lubrication problem and the almost infinite variety of possible lubricant combinations. To many, oil is oil, and an oil man is looked upon with suspicion because he insists that his oil is different from the other fellow's. In trying to evade the wily attacks of the oil salesman, many users of cutting and grinding fluids overlook useful distinctions and fail to take advantage of progress and development.

Standardization and simplification are always desirable objectives, but are not to be attained by sacrificing the benefits of active and aggressive research. We must have greater respect for our grinding and cutting fluid problems and for the men who are honestly trying to solve them. The use of a number of different grinding fluids, including both emulsions and straight oils, seems certain, and those plants which give grinding fluids their earnest study are sure to profit from such efforts.

## Metals That Resist Heat and Humidity

**E**FFECTS of high temperature and humidity on the corrosion of metals, and tests indicating which metals stand up the best under conditions of high temperature and humidity, were dealt with in a paper read by W. L. Maucher and B. W. Jones, of the General Electric Co., before the American Society of Mechanical Engineers at a recent meeting of the Society in Pittsburgh, Pa.

Four groups of eighteen selected metal specimens were subjected to combined high temperature and high humidity in a refinery on the Gulf Coast, to test the effects of the corrosive atmosphere. The tests covered two groups of metals located indoors and two out of doors for about eighteen months.

The following conclusions were arrived at as the result of these tests: When electroplated on copper, tin appears to stand up the best. The cadmium coating was completely gone, and the silver coating was strongly attacked. The lead plating did not look so bad on the surface, but on closer inspection, deep pits were noted in the copper base metal.

Of the chromium alloys tested, 18-8 stainless steel and Nichrome V averaged about the same. These two alloys were the best in this test. The 25 per cent chromium steel was not quite as resistant, and the 12 per cent chromium steel was decidedly inferior to the three other alloys subjected to the test.

While aluminum, untreated, showed a uniform corrosion coating, and the anodized aluminum had scattered pits, this metal gave nearly as good results as the 18-8 stainless steel. Considering its price, it is believed that aluminum, anodized or otherwise properly treated for painting and then given two or more coats of aluminum paint, provides one of the most corrosion-resistant combinations available.

The test on copper and copper alloys showed conclusively that copper and high-copper alloys have low resistance to corrosion in this kind of atmosphere, and should not be used unless protected by some effective coating.

A comparison of Monel metal and nickel indicated that nickel was not attacked as much as Monel metal.

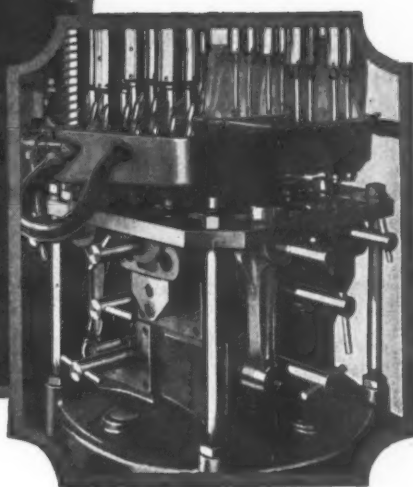
The marked corrosion of unprotected cold-rolled steel indicated the severity of the corrosive atmosphere to which it was exposed and emphasized the necessity of maintenance-painting on any steel parts.

Lead showed up unusually well, although it does not lend itself to many applications because of its physical properties.

An interesting observation on silver was that, although it was heavily attacked, there was no sign of pitting or etching. The metal underneath the corrosion film was very smooth. On large knife switches, the silver surfaces continued to carry their currents satisfactorily.



# Design of Tools and Fixtures



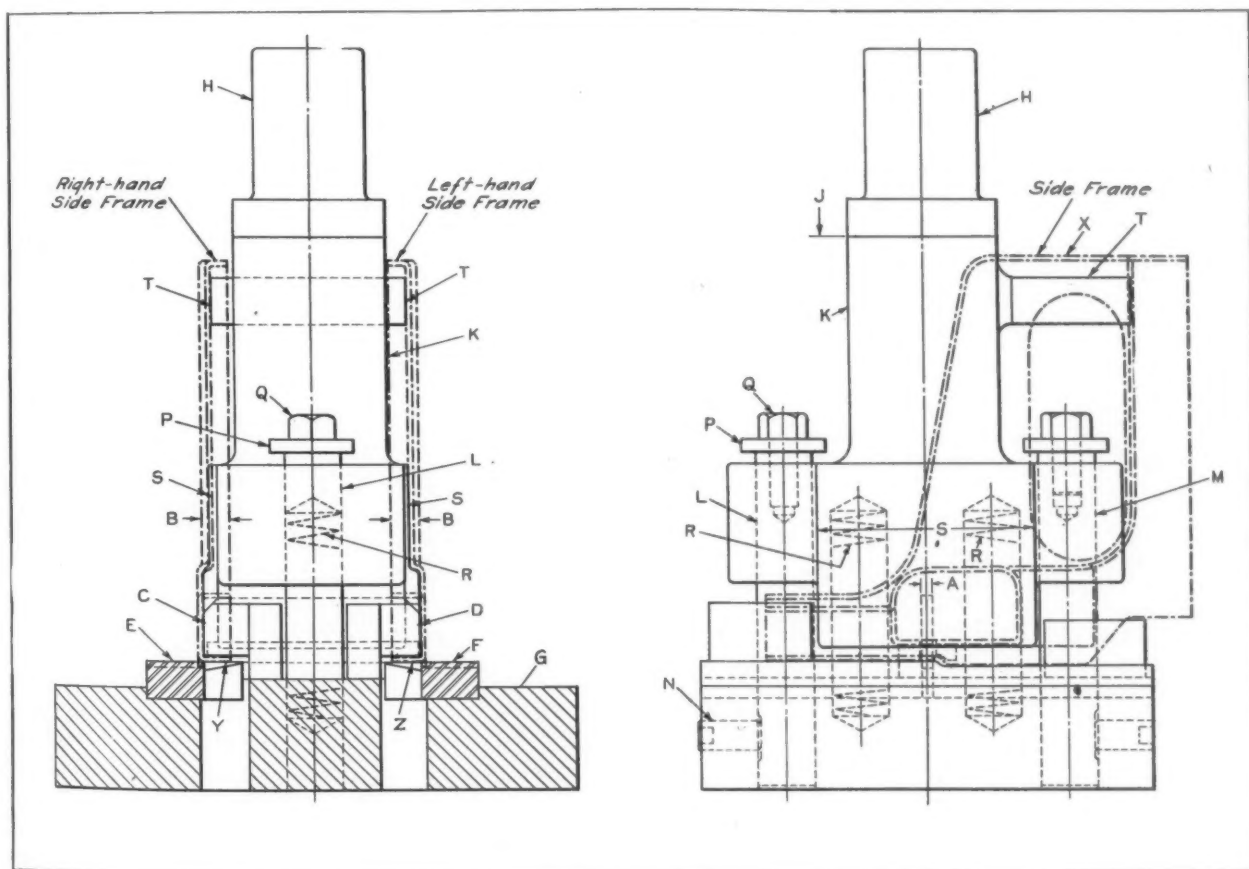
## Die for Cutting Matching Notches in Two Side Frames Simultaneously

By F. SCRIBER

The matched pair of right- and left-hand side frames shown by the dot-and-dash lines in the illustration are required to have matching

notches cut at Y and Z. These notches must be of a uniform width A, and a uniform depth B, as indicated in the side and end views. The die on which the side frames are shown is designed to cut the two notches simultaneously, thus completing the notching of a matched pair of sides at each handling.

The notching punches are indicated at C and



Die for Cutting Matching Notches at Y and Z in Two Side Frames Simultaneously

*D*, and the matched shearing dies at *E* and *F*. The entire die, with the exception of the bumper punch *H*, which is held in the ram of the press, is mounted on the base *G*. Bumper punch *H* is separated from the rest of the structure at the parting line *J* to facilitate mounting it on the press ram.

The holder for punches *C* and *D*, indicated at *K*, is free to slide up and down on the two pins *L* and *M*, which are secured firmly in the die by the set-screws *N*. On top of the pins are stop-washers *P*, held in place by cap-screws *Q*. These stop-washers limit the movement of the punch section on the die pins, the punches being permitted to rise only about 1/4 inch above the die. Springs are provided at *R* to lift the punch section clear of the die, so that the work can be put in place with the flanges at the bottom ends in position for performing the slotting or notching operations at *Y* and *Z*.

The only function of the bumper punch *H* is to strike the notching punch section *K* as it comes down and thus to drive the notching punches down the distance required to force them through the work.

The two frames to be notched are placed in their respective positions on the die by the operator, and are held in place by hand. Suitable projections at *S* and *T* locate the work from the inside and the back inside edge of the frames at both sides when the press is tripped for the notching operation.

## Contour Follower Gage for Inspecting Irregular Profiles

By ALEX S. ARNOTT, Toronto, Canada

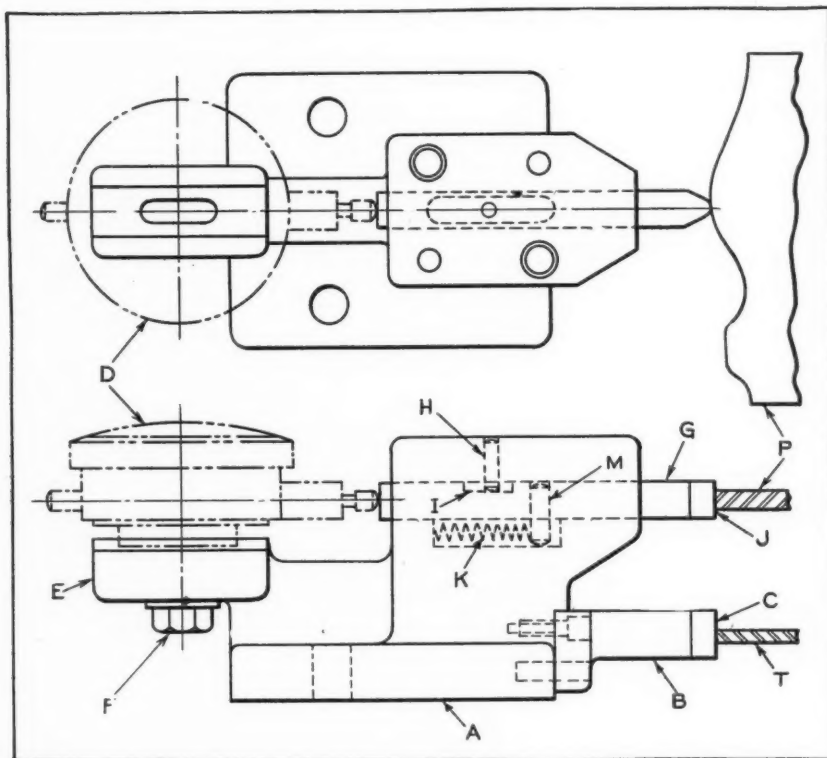
A gage designed for inspecting parts having an irregular outline is shown in the accompanying illustration. It can be used to determine the accuracy of any form or contour, regardless of its irregularity. This is accomplished by comparing the contour of the piece *P* to be inspected with a master templet *T* having a profile of the required accuracy.

All parts of the gage are supported by base *A*, which is accurately machined from a well seasoned casting. Follower *B*, attached to the base, is made from tool steel and has the point *C* hardened and ground. The dial indicator *D*, shown by dot-and-dash lines, indicates any deviation of the work contour from that of the master templet. The dial indicator is fastened to bracket *E* by nut *F*, and is adjustable in any direction.

The indicator-actuating plunger *G* is a slip fit in its housing, and is restricted in its movement by stop-pin *H*, which extends into the groove *I*. The tip *J* of plunger *G* is hardened and ground, while the rest of the plunger is left soft, but has a ground finish. Plunger *G* is kept in the forward position by spring *K*. Pin *M*, which is a press fit in plunger *G*, transmits the pressure exerted by spring *K* to the plunger. This pressure is sufficient to keep plunger *G* in contact with the profile of work *P*.

Templet *T* is made from steel, and is hardened slightly. This templet, made to the exact contour of the part to be inspected, is fastened to a surface plate or fixture. In using the gage, one of the parts to be inspected is placed above the steel templet and the gage is brought up to the work. In some cases, when the parts are light in weight, the gage is fastened to the bench, and work *P* and templet *T* are moved past the gage.

In any case, point *C* of follower *B* makes contact with the steel templet *T*, and plunger *G* touches the outline of part *P*. With the points of follower *B* and plunger *G* in the position shown, the gage can be moved by hand along the contours of the work and templet. If the contour of the part to be inspected is in-



Gage and Master Templet *T* for Inspecting Irregular Profile of Work Indicated at *P*



accurate, plunger *G* will move in and out of the gage, the movement depending on how much the contour of part *P* differs from that of master templet *T*. Any movement of plunger *G* in its holder serves to move the dial plunger in and out, thus revealing any inaccuracy of the part by the dial reading. Follower *B* must, of course, be kept in contact with the steel templet during the inspection operation.

### Facing Attachment Designed with Automatic Feed

A tool which is designed for machining a face located too far from the boring head for adequate, rigid support of the facing cutter, and which replaces the method of facing by means of a bar and flat cutter, is shown in the accompanying illustration. The automatic feed is produced by an eccentric and a gear train.

Referring to the illustration, the boring-bar *M* is provided with a keyway along its whole length, so that the facing tool can be used in any position along the bar. An eccentric *A* is secured in position on the boring-bar by the pressure exerted upon the key *L* by the set-screw *B*, which is tightened or loosened when the hole *N* in the tool-holder *T* is brought in line with the head of the set-screw.

The spur gear *C* is driven directly by the boring-bar, and, in turn, rotates the axially connected gears *D* and *E*. The gear *E* meshes with the spur gear *F*, which rotates the tool-holder *T* by means of the driving pin *G* and a driving plate *H*. The pin is of hardened steel, and makes driving contact with the driving plate by a sliding fit in a radial slot. The working surfaces of this slot are also hardened. Spur gears *C*, *D*, and *E* each possesses forty teeth of 8 diametral pitch, while gear *F* has forty-one teeth cut on the same pitch circle as for forty teeth of 8 diametral pitch. This arrangement has been found to be quite satisfactory in practice.

The eccentric *A* makes forty-one revolutions, while the tool-holder *T* makes only forty revolutions. This means that the tool is given an automatic and uniform feed,

in addition to its circular cutting motion, and therefore travels in a flat spiral path. The steel plate *K* is provided with bronze bushings for the gearing, and can be made in a convenient form for mounting on the machine.

\* \* \*

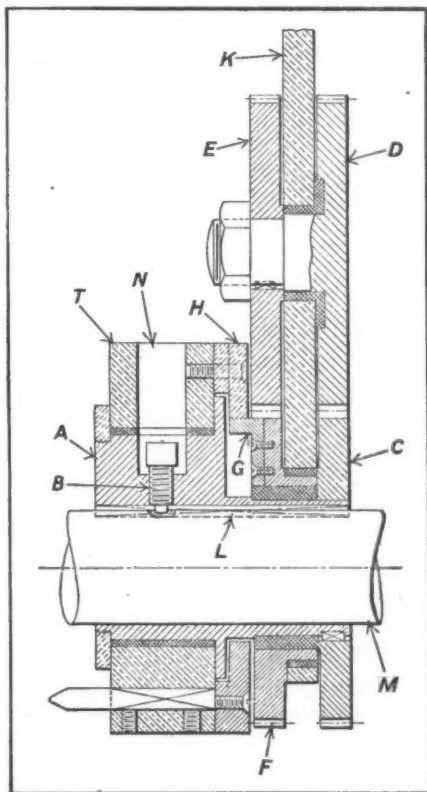
### High-Speed Milling Results

In a paper read before the American Society of Mechanical Engineers at its recent Pittsburgh meeting, J. Q. Holmes, master mechanic of the plant of the Eastern Aircraft Division of General Motors, Linden, N. J., mentioned that steel forgings are now being milled with negative-rake carbide-tipped milling cutters at a surface speed of from 800 to 1200 feet per minute, as compared with from 40 to 60 feet per minute using regular type high-speed steel cutters. At the same time, the feed has been increased to from 15 to 30 inches per minute, compared with from 7/16 inch to 1 1/2 inches per minute. In one specific case, the speed of the milling machine spindle was increased from 37 R.P.M. to 407 R.P.M. The material being milled was annealed, normalized, or heat-treated steel with a tensile strength up to 180,000 pounds per square inch.

The finish obtained is unusually good. Many parts, after being milled at these high speeds, require no additional surface grinding. In the past, many milled forgings required surface grinding because of the rough condition in which they were left by the slow milling speed.

\* \* \*

In a paper read by Henry W. Kayser, of the Falk Corporation, Milwaukee, Wis., before the recent annual meeting of the American Gear Manufacturers Association, reference was made to bearings for high-speed gear drives. Mr. Kayser mentioned that for high-speed gear drives, the sleeve type is the only one that can be used. The Falk Corporation has been operating gearing drives with journal speeds of 350 feet per second (21,000 feet per minute) with entirely satisfactory results.



Facing Attachment with Automatic Feed

# Materials of Industry

## THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

### Two Ladle Inoculation Alloys for Improving Cast Iron

Two ladle inoculation alloys are being produced by the Electro Metallurgical Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York City, for the improvement of cast iron. "SMZ" alloy contains silicon, manganese, zirconium, and iron. It produces a strong graphitizing effect, and provides an economical and efficient means of obtaining a machinable high-strength gray iron from a low-silicon white iron; producing an improved gray cast iron by a ladle addition; reducing chilling at the edges, corners, and thin sections of castings without sacrificing mechanical properties in the heavier sections; and reducing wall sensitivity of cast iron.

"SM" ferrochrome alloy is used for making chromium additions to iron or steel in the ladle. This alloy is made in two grades—a high-carbon grade containing 60 to 65 per cent chromium and 4 to 6 per cent each of silicon, manganese, and carbon; and a low-carbon grade containing 62 to 66 per cent chromium, 4 to 6 per cent each of silicon and manganese, and a maximum of 1.25 per cent carbon. . . . .201

### Furane Derivative Resin Available for Commercial Use

The U. S. Stoneware Co., Akron, Ohio, has announced the availability for limited commercial and experimental use of a new basic resin made from waste agricultural products, such as oat hulls and corn cobs, and having widespread immediate applications for impregnation, bonding, and protective coating.

The new resin, named "Duralon," a furane derivative, is characterized by the lowest water absorption of any organic resin; insolubility (after activation) in any solvent or combination of solvents; high electrical resistance; absolute stability in storage and handling; and workability.

In its pure form, it is a heavy, viscous liquid, dark maroon in color. Upon the incorporation

of catalysts and the application of mild heat, Duralon reverts to an extremely hard, dense, black substance. Varying physical, chemical, and electrical properties can be developed in the basic resin by incorporating the usual fillers and lubricants. In certain stages, Duralon can be readily machined by drilling, milling, turning, sanding, grinding, etc.

While preliminary studies indicate that Duralon possesses definite molding possibilities, its paramount immediate importance is as an impregnant, a laminating and bonding agent, and a protective coating material. Duralon solutions can be applied as coatings by any of the conventional processes. These solutions can also be used for the impregnation of porous materials, such as stone, cement, plywood, asbestos, glass fibers, and other fibrous materials, or as bonding agents for abrasive compounds, powdered metals, etc., and the adhesive bonding of fibrous materials to each other. . . . .202

### New Material Consisting of Plastics and Synthetic Rubber

The Chemical Division of the B. F. Goodrich Co., Akron, Ohio, announces the development of a new group of materials consisting of a combination of plasticized vinyl chloride resins and certain butadiene synthetic rubbers. The new materials thus formed possess most of the best properties of each of the component materials. These compositions can be extruded, molded, and calendered. They can be produced with a mirror-like finish. Among the properties possessed by the combination of these two materials are resistance to the effects of sunlight and ozone; increased resistance to benzene and similar solvents; and low-temperature flexibility, combined with excellent heat resistance, tear resistance, and resilience.

The new products are said to be suitable for jackets for insulating wire and cable, hose covers, extruded and molded parts for the automotive and aviation industries, insulation and cushioning pads, tank linings, and soles for shoes. . . . . 203

## Employing War Veterans at the Reed-Prentice Plant

At the plant of the Reed-Prentice Corporation, Worcester, Mass., a definite procedure has been adopted for employing war veterans. In the first interview with the applicant, the Personnel Department tries to determine from the serviceman's past record what work he is best fitted for. In carrying on this conversation, the interviewer endeavors to convey to the veteran that the questions are asked merely in order that he may be placed in a job he is capable of filling and that is satisfactory to him. Every effort is made to establish the interview on a friendly basis.

After this preliminary interview, the veteran is turned over to the Medical Department, where it is determined whether he can be recommended for employment. Here a complete record is made of his health and physical condition. If veterans have had more than six months of active or foreign service, they are also requested to visit the Veterans' Rehabilitation Clinic for a complete examination, after which they return to the plant physician. The next step is to determine what type of work the veteran can do in case he is disabled.

If physically disabled, a list is made of the types of jobs that he can perform; there is also a list of jobs that he cannot do. These lists are presented to the personnel manager. If the veteran is mentally disabled, a consultation with a psychiatrist is held. With his advice and under his supervision, a suitable type of employment is determined upon. The mental cases are allowed time off, with pay, for their visit to the psychiatric clinic, which is held weekly at the Worcester City Hospital. Close cooperation is maintained between this clinic and the plant physician concerning the progress being made by the veteran.

By handling veteran employment in this manner, there has rarely been any error made in the work chosen. The methods, while direct and simple, have proved effective and successful.

\* \* \*

## Disposal of Surplus Equipment

The three fundamental principles that have been adopted by the Surplus War Property Administration should prevent any undue hardships on the industries concerned with the disposal of surplus. It is intended that the disposal shall be made through regular trade channels; speculators who temporarily might enter into the business of handling surplus stocks of equipment are not to be encouraged; and dumping that would upset the regular trade channels and cause unemployment will be avoided.

## Lathe Set-Up for Drilling Accurately Spaced Holes

By J. BOHAN, Steam Division  
Westinghouse Electric & Mfg. Co.  
South Philadelphia, Pa.

The drilling of accurately spaced holes in 6-inch drain pipes for surface condensers was performed in a very efficient manner by the use of the unique engine lathe set-up shown in the illustration. The drain pipes are 18 feet 6 inches long and require the drilling of 200 holes.

A special holder, which was designed to hold two air drilling machines so that they are properly spaced to maintain the required pitch or



Engine Lathe Set-up for Drilling Holes in 6-inch Pipes for Surface Condensers

distance between holes, was secured in the tool-holder slot of the compound rest. With this equipment, two holes are drilled at one time, hand-feed being used to spot the holes, after which the cross-feed is engaged for drilling through the pipe wall.

Only the first hole in each row need be laid out, as a micrometer stop attached to the ways, used in conjunction with block, plug, and pin gages, provides for accurate spacing. After completing the drilling of one row of holes, it is only necessary to turn the faceplate by hand and align the drill with the lay-out for the succeeding row of holes.

\* \* \*

A National Electronics Conference, at which all phases of electronics will be discussed, will take place in Chicago, Ill., at the Medinah Club, on October 5 to 7. For further information, address National Electronics Conference, 520 N. Michigan Ave., Chicago 11, Ill.



# New Trade Literature

## RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 193 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the August Number of MACHINERY

### Kirksite Molds for Plastics

NATIONAL LEAD CO., 111 Broadway, New York 6, N. Y. Circular containing an article on Kirksite molds for plastics, summarizing the results of tests made by an aircraft company to determine whether cast-zinc alloy molds could be used in place of the more costly steel molds for plastics. ....1

### Milling Machine Engineering Data

CINCINNATI MILLING MACHINE Co., Cincinnati 9, Ohio. Publication M-1322, containing engineering data covering the Cincinnati line of milling, broaching, and cutter sharpening machines, especially compiled for tool engineers, plant lay-out men, and methods engineers. ....2

### Centralized Lubrication Systems

FARVAL CORPORATION, 3276 E. 80th St., Cleveland 4, Ohio, Bulletin 25, describing how centralized lubrication systems increase the production output of machinery and make impressive savings in time, power, and lubricants. ....3

### Vibration Absorbing Mountings

GENERAL TIRE & RUBBER CO., MECHANICAL GOODS DIVISION, Wabash, Ind. Catalogue entitled "General Silentbloc — Flexible Rubber Bearings, Mountings, and Couplings for Machinery and Equipment in Motion." ....4

### Self-Tapping Screws

PARKER-KALON CORPORATION, 202 Varick St., New York 14, N. Y.

Users' Guide, containing useful engineering and production data on the application of self-tapping screws. Copies available to engineering and production executives only. ....5

### High-Speed Sawing Machines

CONTINENTAL MACHINES, INC., 1312 S. Washington Ave., Minneapolis 4, Minn. Bulletin descriptive of the new DoAll "Zephyr" high-speed friction cutting machine for shaping and fabricating all materials. ....6

### Automatic Lathes

SUNDSTRAND MACHINE TOOL CO., 2530 Eleventh St., Rockford, Ill. Bulletin L1, entitled "How to Increase Production on Short-Run Turning with an Automatic Lathe." Actual production data on various jobs is given. ....7

### Weight Calculating Slide-Rule

DAYTON ROGERS MFG. CO., Minneapolis 7, Minn., is distributing free to those making the request on a company letterhead, a slide-rule for calculating weights of all sheet material used in the average punch press department. ....8

### Finishing Lathes

SCHAUER MACHINE CO., 2069 Reading Road, Cincinnati 2, Ohio. Catalogue 440, describing a line of speed lathes for finishing, polishing, burring, lapping, and grinding small metal and plastic parts. ....9

### Precision Tapping Attachment

DOUGLAS MACHINERY CO., INC., 150 Broadway, New York 7, N. Y. Circular descriptive of the Rotorex

precision all-purpose tapping attachment, which is applicable to standard 14- and 17-inch Delta drill presses. ....10

### Planers

CINCINNATI PLANER Co., 3126 Forrer St., Cincinnati 9, Ohio. Instructions for the erection, maintenance, and operation, and parts list for Cincinnati Hypro double-housing and open-side planers. ....11

### Heat-Treating of Resistance Welds

GENERAL ELECTRIC Co., Schenectady 5, N. Y. Bulletin GEA-4201, entitled "Heat-Treat Your Resistance Welds by Electronic Tempering Control." ....12

### Ball Bearings

NEW DEPARTURE DIVISION GENERAL MOTORS CORPORATION, Bristol, Conn. Booklet entitled "Why Anti-Friction Bearings," describing in detail the development, uses, and advantages of ball bearings. ....13

### Automatic Machines and Special Machine Tools

DAVIS & THOMPSON Co., 6411 W. Burnham St., Milwaukee 14, Wis. Bulletin 90, covering this company's line of automatic drilling and milling machines and special machine tools. ....14

### Plastics

HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio. Bulletin 4404, entitled "Plastics — The Pressure Processing of Synthetic Resins," describing materials, processes, and equipment. ....15

## Luminescent Pigments

NEW JERSEY ZINC Co., 160 Front St., New York 7, N. Y. Publication entitled "The ABC of Luminescence," showing practical applications of fluorescent and phosphorescent pigments. 16

## Lubrication

SUN OIL Co., 1608 Walnut St., Philadelphia 3, Pa. Wall chart entitled "Save and Serve with Proper Lubrication," giving concise directions for obtaining the best lubrication results. 17

## Stamping Trimmers

QUICKWORK DIVISION OF WHITING CORPORATION, 15673 Lathrop Ave., Harvey, Ill. Bulletin QW-119, on the application and operation of Quickwork stamping trimmers. 18

## Forging Hammers

CHAMBERSBURG ENGINEERING Co., Chambersburg, Pa. Poster for forge shops, 20 by 30 inches, printed in bright colors, emphasizing the importance of hot flash. 19

## Gravity-Feed Oilers

TRICO FUSE MFG. Co., 2948 N. 5th St., Milwaukee 12, Wis. Bulletin entitled "Gravity-Feed Oilers with Crystal Clear Reinforced Plastic Bottles." 20

## Continuous Printing Machine

CHARLES BRUNING Co., INC., 100 Reade St., New York City. Circular descriptive of the Bruning

"Copyflex," a continuous photographic printing machine. 21

## Milling Cutter Grinding Chart

INGERSOLL MILLING MACHINE Co., Rockford, Ill. Chart, 15 by 23 inches, illustrating basic methods of grinding milling cutters for different kinds of materials to be milled; intended for tool-room wall chart. 22

## Valve-Chipper Repair Chart

INGERSOLL-RAND Co., 11 Broadway, New York 4, N. Y. Wall chart, 22 by 38 inches, entitled "Easy Repair Operations for I-R Flapper Valve Chippers." 23

## Flexible Shafting

STOW MFG. Co., 15 Shear St., Binghamton, N. Y. Book 441, entitled "The How and Why of Flexible Shafting—What it Does—Where it Fits." 24

## Welding Positioners

RANSOME MACHINERY Co., Dunellen, N. J. Bulletin 2123, containing a description of the complete line of Ransome welding positioning equipment. 25

## Carbide Tools

WILLEY'S CARBIDE TOOL Co., 1340 W. Vernor Highway, Detroit 1, Mich. Catalogue 27, on carbide tools, gages, and dies, and carbide tool grinders. 26

## Plastics for Dies and Fixtures

ADHERE, INC., 1220 Maple Ave., Los Angeles 15, Calif. Bulletin on "Toolite," a thermosetting phenolic plastic for casting tools, dies, and fixtures. 27

## Resinoid Grinding Wheels

NORTON Co., Worcester 6, Mass. Circular on Norton resinoid grinding wheels for steel and annealed malleable castings. 28

## Spring Washers

NATIONAL LOCK WASHER Co., Newark, N. J. Bulletin on non-corrosive coating for all types of spring washers. 29

## Lathes

SOUTH BEND LATHE WORKS, Dept. M-2, South Bend 22, Ind. Catalogue 150, covering the full line of South Bend lathes. 30

## Grinding Machines

HILL ACME Co., 6400 Breakwater Ave., Cleveland 2, Ohio. Circular on open-side, horizontal-spindle surface grinders. 31

## Metal-Cutting Power Saws

PEERLESS MACHINE Co., Racine, Wis. Bulletin HC-50, on mechanical and hydraulic metal-cutting power saws. 32

## Drill Steels

JESSOP STEEL Co., Washington, Pa. Bulletin on hollow and solid

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listed on pages 192-194 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue to:

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drill steels—rounds, hexagons, and quarter octagons. ....33

### Plug-Gage Blank Set

GEORGE SCHERR CO., INC., 199 Lafayette St., New York 12, N. Y. Circular descriptive of the new Atlantic Emergency Set of cylindrical plug-gage blanks. ....34

### Precision Gages and Carbide Tools

METRO TOOL & GAGE CO., 4240 Peterson Ave., Chicago 30, Ill. Catalogue on precision gages and carbide-tipped tools. ....35

### Production Reaming Tools

MADISON MFG. Co., Spring and Wulf Sts., Muskegon, Mich. Catalogue 21, on adjustable reamers and bars. ....36

### Spotting and Centering Drills

WHITMAN & BARNES, 2108 W. Fort St., Detroit 16, Mich. Circular on high-speed spotting and centering drills. ....37

### Conveyor Equipment

LINK-BELT Co., 307 N. Michigan Ave., Chicago, Ill. Book No. 1915, on the "100" Link-Belt anti-friction idler for belt conveyors. ....38

### Crank Shapers

GENERAL ENGINEERING & MFG. Co., 1523 S. Tenth St., St. Louis, Mo. Bulletin GC-12, on Gemco multi-purpose crank shapers. ....39

### Electronic Control for Welding

WELTRONIC Co., 19500 W. Eight Mile Road, Detroit 19, Mich. Technical bulletin WTTC-44, containing data on Weltronic weld timer-contactors. ....40

### Precision Bearings

EQUITABLE BEARING Co., INC., 4631 Cottage Grove Ave., Chicago 15, Ill. Bulletin on ball, roller, radial, and thrust bearings. ....41

### Die-Handling Equipment

LYON - RAYMOND CORPORATION, Greene, N. Y. Bulletin 135, on die-handling trucks, tables, and other die-handling equipment. ....42

### Steel Stamps

JAS. H. MATTHEWS & Co., 3942 Forbes St., Pittsburgh 13, Pa. Bulletin A-2 on "Lo-Stress" steel hand stamps. ....43

### Surface Peening Equipment

W. W. SLY MFG. Co., 4700 Train Ave., Cleveland 2, Ohio. Circular entitled "Surface Peening for Metal Improvement." ....44

### Electronic Products

NORTH AMERICAN PHILIPS Co., INC., 100 E. 42nd St., New York 17, N. Y. Booklet on "Norelco" electronic products. ....45

### Tap Extractors

WALTON Co., 94 Allyn St., Hartford 3, Conn. Circular entitled

"Walton Tap Extractors Back Out Broken Taps." ....46

### Machine Tools

MILES MACHINERY Co., Saginaw, Mich. List 177, entitled "Quality Machine Tools for Prompt Delivery." ....47

### Welding Positioners

HARNISCHFEGER CORPORATION, 4400 W. National Ave., Milwaukee 14, Wis. Bulletin P2-1, on welding positioners. ....48

### Hydraulic Vises

REIMULLER BROTHERS Co., 9400 Belmont Ave., Franklin Park, Ill. Circular on "Hy-Speed" hydraulic vises. ....49

### Carbide Tools

KENNAMETAL, INC., Latrobe, Pa. Catalogue 44, on cemented-carbide tools, blanks, and specialties. ....50

### Collet Chucks

GILBERT BAKER MIDLAM Co., Dayton 2, Ohio. Circular on G-B-M 4 1/2-inch collet step chucks. ....51

### Precision Production Tools

ACME TOOL Co., 200 Church St., New York 13, N. Y. Catalogue 44, on precision production tools. ....52

### Spring Lock-Washers

EATON MFG. Co., RELIANCE DIVISION, Massillon, Ohio. Folder 142, on spring lock-washers. ....53

## To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 195-218 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equip-

ment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in August, 1944, MACHINERY.

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## To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on page 190, fill in below the identifying number found at the

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# Shop Equipment News

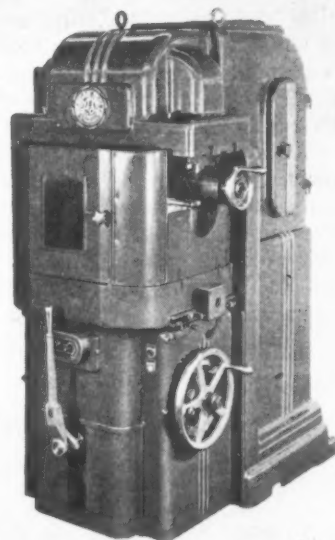
*Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market*

## Cross Automatic Machine for Processing Cylinder Blocks

The Cross Co., 3250 Bellevue Ave., Detroit 7, Mich., has just announced the development of a new completely automatic transfer type processing machine for cylinder blocks. The outstanding feature of this machine is the arrangement whereby work is automatically picked up from the conveyor, completely processed, ejected from the machine, and then delivered to the conveyor without requiring any action on the part of the operator. The production rate of this machine when operating at 80 per cent efficiency is forty-five pieces per hour.

Although the particular machine illustrated has only two stations—a drilling and a tapping station—the builders state that the same principle is now being used in other machines having many more

stations for processing intricate work requiring a multiplicity of operations. The complete automatic operating cycle includes pick-up of the work from the conveyor and power loading of the work into the machine; transfer of the work from station to station in the machine; location and clamping of the work in the machine during the cutting operations; simultaneous drilling and tapping operations; release of the work after the cutting operations are completed; and power ejection and delivery of the work to the conveyor. It is a comparatively simple matter to fit machines of this type into the production line, equipping them to perform a variety of machining operations with a considerable saving in man power and without requiring the attention of a skilled operator. 61

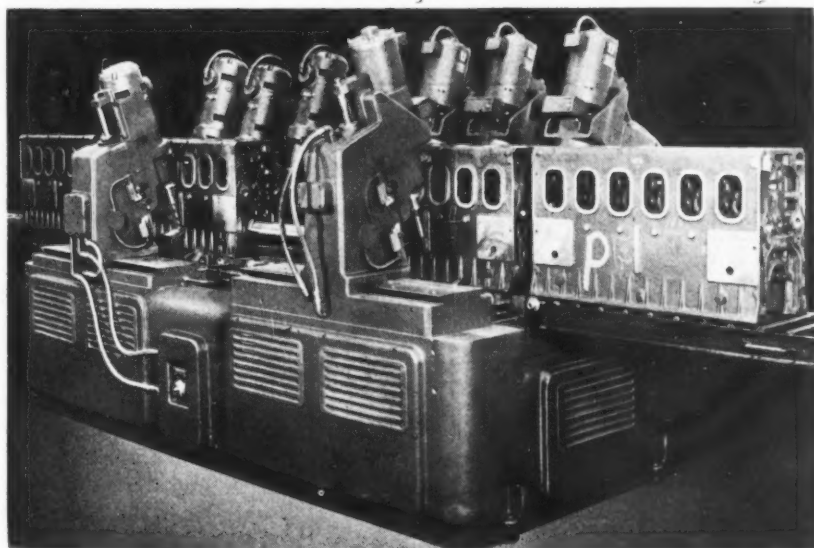


Michigan Improved Rotary Crossed-axis Gear-finishing Machine

## Improved Michigan Rotary Gear-Finishing Machine

Production of an improved line of the 860 series of rotary crossed-axis gear-finishing machines has just been announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The line comprises four basic models—the 860 for shaving narrow face and shoulder gears by the “under-pass” method; the 860-B for shaving wider faced gears by the transverse shaving method; the 860-A in which both the under-pass and transverse shaving methods are employed; and the 860-C for shaving the teeth of internal gears. The first three models are made in three sizes for shaving gears with maximum outside diameters of 8, 12, and 18 inches.

Cone-drive gearing designed to



Cross Automatic Cylinder Block Processing Machine Equipped for Drilling and Tapping Operations

To obtain additional information on equipment described on this page, see lower part of page 194.

MACHINERY, August, 1944—195

give quieter and smoother operation; ability to produce gears with a superior finish; provision for increasing power to handle special jobs; improved facilities for curve-shaving; greater flexibility in applying the same machine to different jobs; and reduced maintenance cost are improvements claimed for this new line of machines.

The set-up of the curve-shaving units, available as optional equipment on the 860 machine, is both simple and positive, eliminating trial-and-error adjustments. Either the entire tooth face can be curve-shaved or any desired amount of the center section of the face can be left flat, relieving only one or both ends of the tooth. The amount of relief at the two ends can be varied by offsetting the flat section in the center to one side or the other. Thus the device is adjustable to meet practically any condition of misalignment of gears or shafts.

This machine is so designed that the vertical in-feed of the cutter takes place during the first half of the reciprocating stroke rather than during the dwell at the end of

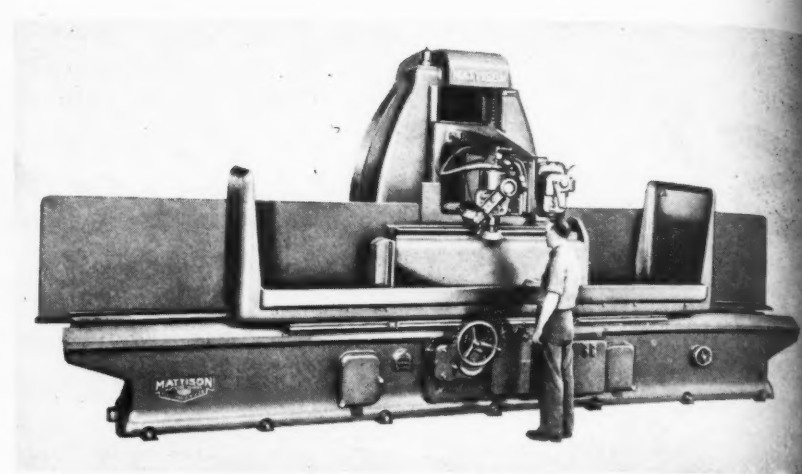


Fig. 1. Precision Vertical-spindle Way Grinder Built by the Mattison Machine Works

the stroke, an arrangement that serves to shorten the dwell period and thus increase production. Electrical control panels are completely sealed, even against oil fumes, to lengthen the life of electrical contacts. A vernier scale at the front of the sealed cutter housing simplifies the crossed-axis setting.

the desired angle. This machine is built in various sizes, with tables ranging from 12 inches wide by 48 inches long up to 36 inches wide by 192 inches long.

### Mattison Vertical-Spindle Grinder for the Precision-Finishing of Machine Ways

The Mattison Machine Works, Rockford, Ill., have developed a new type grinder for the precision-finishing of tables, slides, saddles, heads, turrets, and other parts having angular machined ways or surfaces. Such parts can be ground on this machine to exceptionally close limits of accuracy and a fine finish. The new machine eliminates the necessity for hand-scraping and makes possible the finishing of ways that have been hardened. It can also be used for grinding many flat parts.

Fig. 1. shows the grinder equipped for finishing the angular surface of dovetail ways on a machine column. The diagrams in Fig. 2 give a good idea of the range of work handled on the new machine. The grinding head unit is mounted on a dovetail slide, which is part of the vertical slide assembly. This slide is adjustable horizontally by hand

and has a motor-driven rapid traverse.

The head unit can be swiveled 60 degrees. A graduated circle provides for rough setting of the grinding unit to the desired angle. Final adjustment is made by means of a sine bar or checking gage. A power-driven truing device is furnished for dressing the wheel to

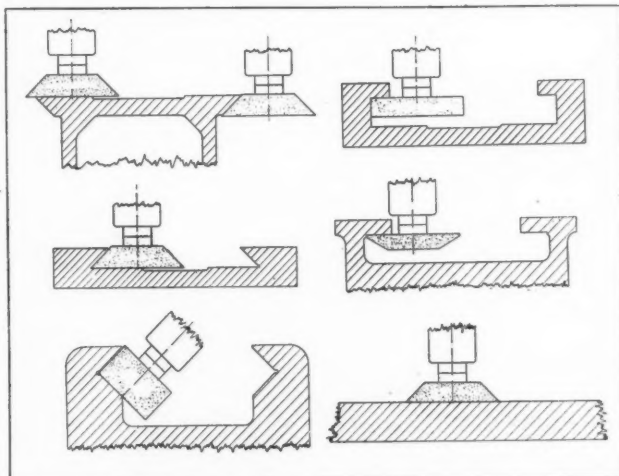


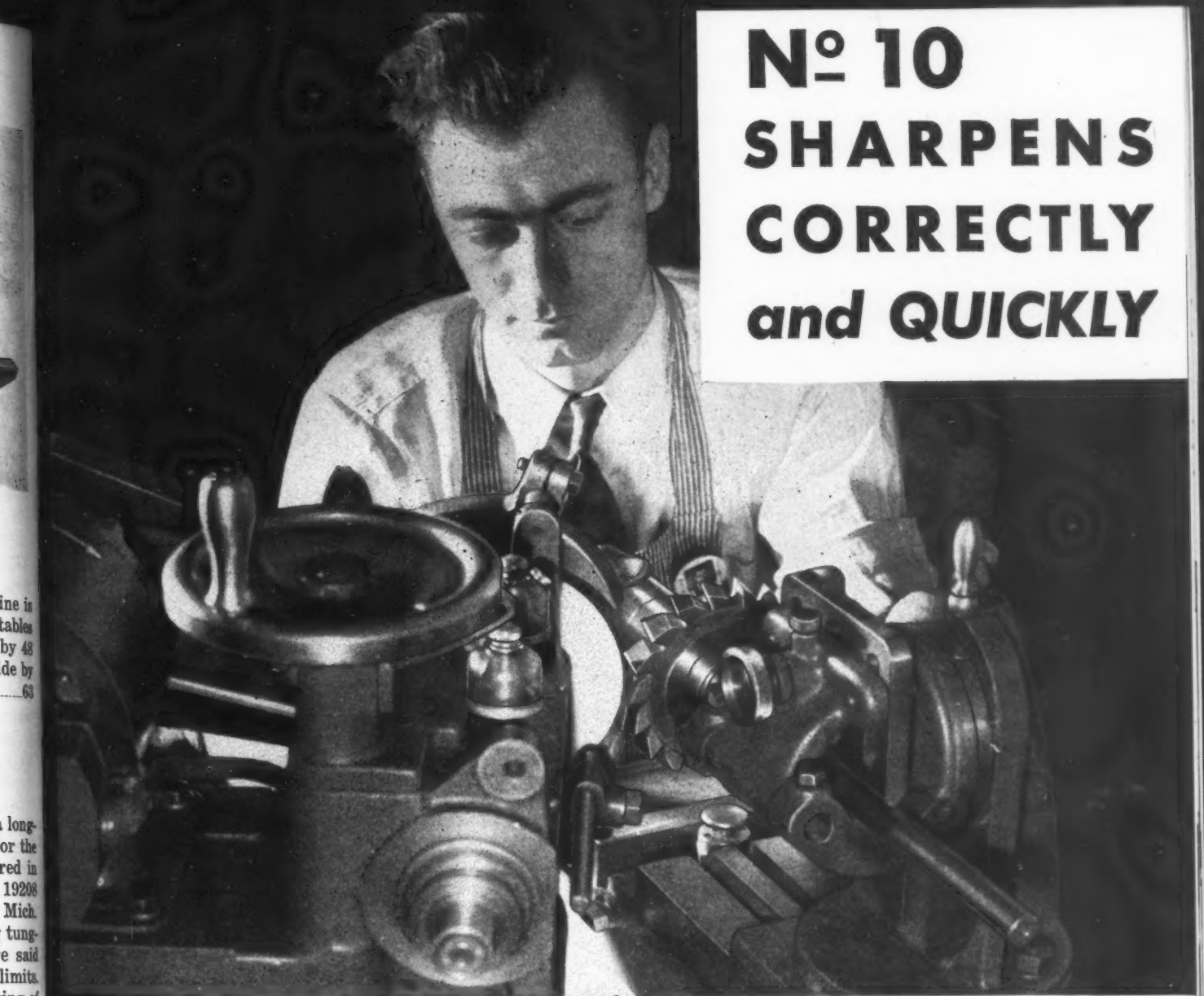
Fig. 2. Typical Examples of Way Grinding Work Performed on Machine Shown in Fig. 1

### Jansson Carbide Gage-Blocks

Exceptional accuracy over a longer period of time is claimed for the new carbide gage-blocks offered in sets by the Jansson Gage Co., 19208 Glendale Ave., Detroit 23, Mich. Made of tough wear-resisting tungsten carbide, these blocks are said to be held to extremely close limits. Three all-carbide sets, consisting of one ten-block and two two-block sets, are available. One set of eighty-one steel blocks with two 0.050-inch tungsten-carbide blocks intended for taking the wear can also be furnished.

The Jansson ten-block carbide set ranges in size from 0.050 to 0.0509 inch in steps of 0.0001 inch. The two smaller sets are intended primarily for use as wear blocks with steel gage-blocks. One contains two 0.050-inch blocks, while the other contains two 0.100-inch blocks. Among other advantages claimed for these carbide gage-blocks is the remarkable ease with which they can be wrung together to give the required size, a factor of importance in handling small sizes.

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Precision Sharpening of milling cutters and tools is performed efficiently on the No. 10 Cutter and Tool Grinding Machine . . . a dependable Machine built for the job of making cutting tools serve longer . . . and better.

- Low fixed height of Machine gives good visibility of wheel and work
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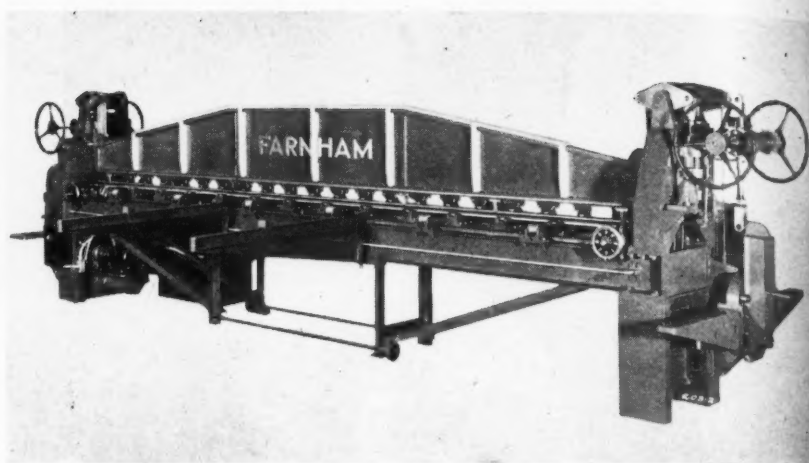
# **BROWN & SHARPE**



## Farnham Forming Roll with Templet Control

A new model forming roll machine capable of automatically forming airplane leading-edge skins or fuselage skins of sheet-aluminum alloy materials to the desired contours in one pass through the rolls has been brought out by the Farnham Mfg. Co., 1646 Seneca St., Buffalo, N. Y. Flat aluminum-alloy sheets fed into one side of the machine come out of the other side finish-formed to the required curved shape. This simple procedure requires no particular training, an unskilled worker being capable of operating the machine efficiently. The former process of changing dial settings and reversing the rolls several times during the rolling operation has been eliminated, with the result that production has been increased from six to ten times.

The movement of the upper roll is controlled by two templets, one on each end of the machine. As the part feeds through the rolls, these templets raise or lower each end of the upper roll as required to produce the desired contour. Hydraulic pressure is used to keep the followers in contact with the templets and



Machine Developed by the Farnham Mfg. Co. for Form-rolling Aluminum-alloy Sheets

also to raise the upper roll quickly to permit inserting the sheet to be formed. Adjustable stops are provided for locating the sheets.

All the advantages of preceding machines of this type, such as provision for forming minimum nose radius and tapered sections, are retained in the new model. The particular machine shown in the accompanying illustration will form aluminum sheets 1/16 inch thick by 15 feet long to a minimum radius of 1 1/4 inches. 65

## Improved Broach-Sharpening Machine

The Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., has developed an improved Model CS2 broach-sharpening machine,

which is especially designed to take into account the large number of women now employed for tool-sharpening operations and also to



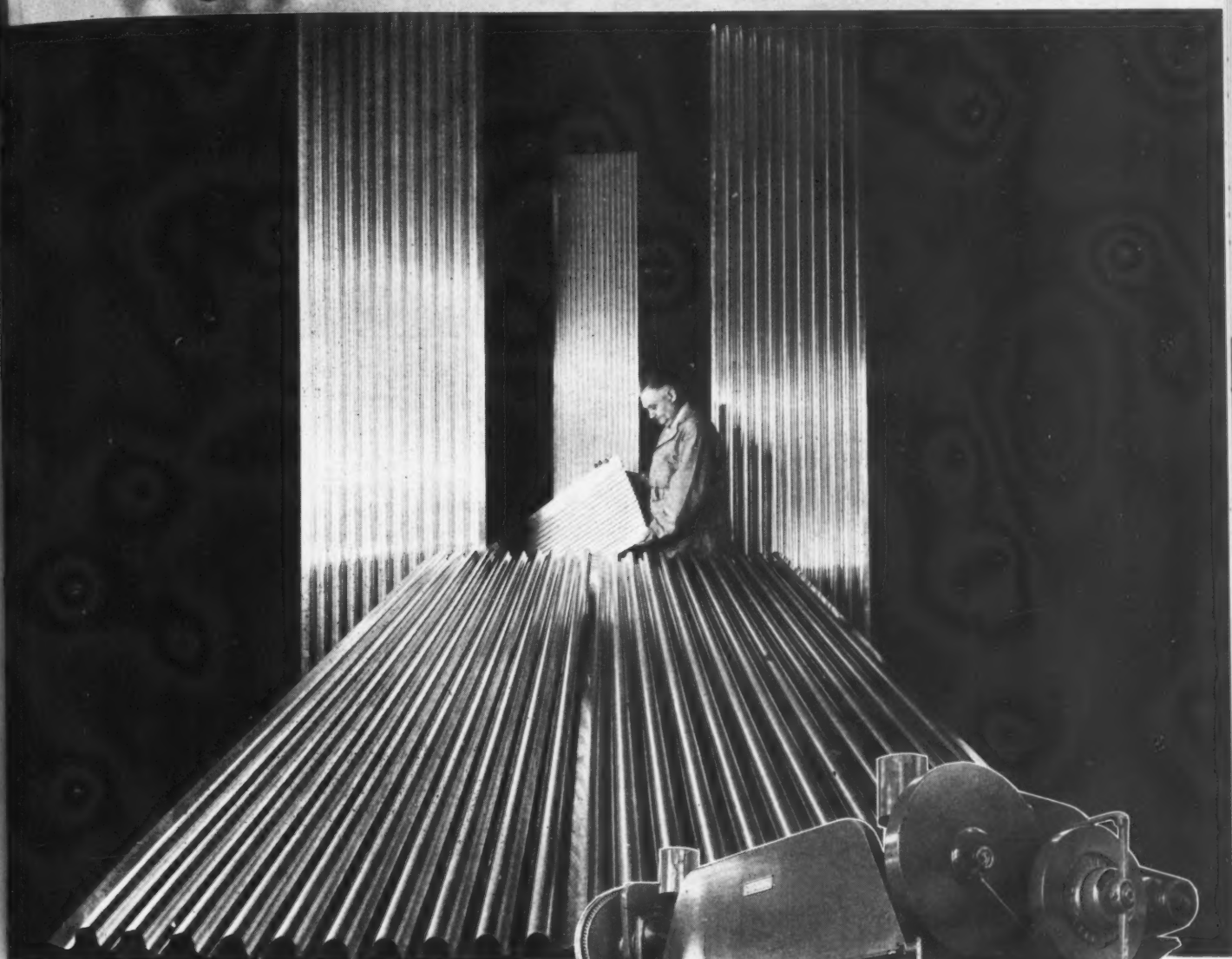
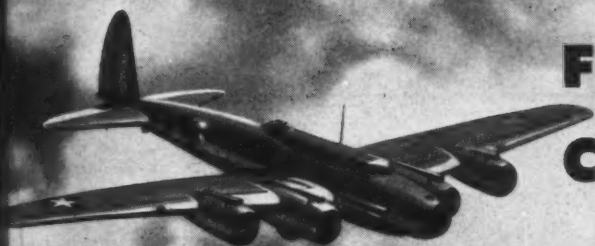
Colonial Broach-sharpening Machine Designed to Facilitate the Grinding of Large Broaches

provide for grinding the larger broaches now in use. This machine will sharpen round and flat broaches, spline and serrated types, etc., in sizes ranging from the smallest up to broaches 7 feet long with a maximum diameter of 6 inches. Flat broaches with a width of 8 inches can be sharpened.

The outstanding feature of this machine is the light-weight alloy construction of the sliding head, which facilitates the broach-sharpening operations. This head weighs only about one-third as much as the iron or steel head. The sliding head is supported and guided by full anti-friction double-row rollers. All anti-friction bearings are completely sealed against the entry of grinding dust. The Colonial dual-ratio micrometer handwheels, available at slightly extra cost, provide accurate control to within 0.0001 inch.

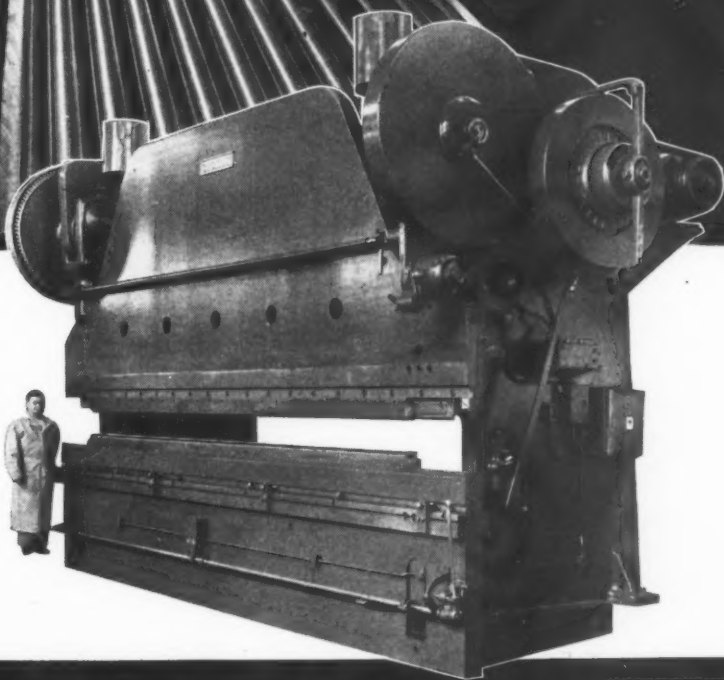
A special roller curtain for protecting the ways of the machine when the table is moved to one side or the other can be furnished at additional cost. One advantage of the roller curtain is that it reduces the length of the floor space required 6 feet when handling broaches of the maximum length. Headstocks for cylindrical broach sharpening are provided with reduction gearing that furnishes spindle speeds of 200 and 400 R.P.M. Tailstocks are equipped with quick release, spring-loaded centers, and barrel type steady-rests, and have contact points made from round fiber to protect the broach. Adjustable stops with coil-spring cushions on the broach-head cross-slide guard against shock at the end of the stroke when flat broaches are being sharpened. 66

# FLYING CORRUGATIONS...



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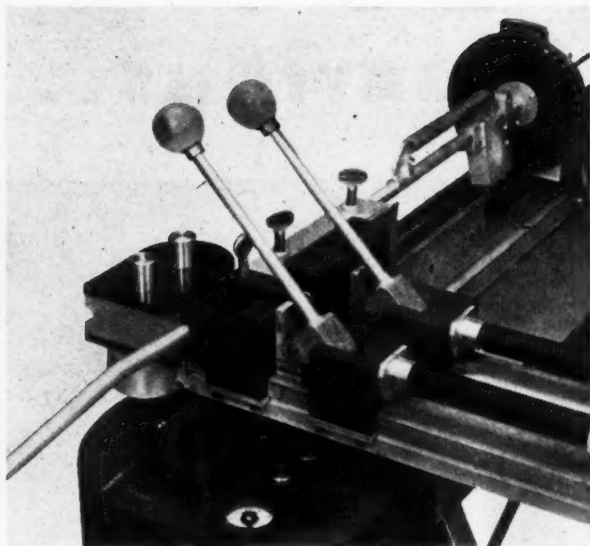


Fig. 1. "Bendmaster" Tube-bender Made by Leonard Precision Products Co.

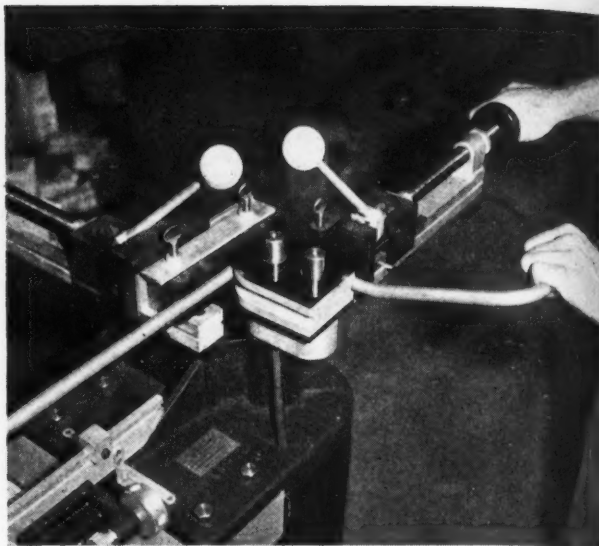


Fig. 2. Bending Tubing on the "Bendmaster" Illustrated in Fig. 1

### Leonard-Douglas Tube-Bender

A new manually operated tube-bender known as the Leonard-Douglas "Bendmaster," designed by the Douglas Aircraft Co., is now being manufactured under exclusive license by the Leonard Precision Products Co., 1100 Larson Ave., Garden Grove, Calif. This bender will handle non-ferrous tubing from 3/8 inch to 1 1/4 inches outside diameter, producing from one to ten different bends in a single 9-foot length of tubing. Bends can be made to any angle up to 180 degrees and at any radial angle. Special models are available for bending tubing up to 20 feet in length.

In setting up the bender, the operator selects the radius block and mandrel specified on the job sheet furnished with each order. From data also furnished on the job sheet, stops are set for accurate location of the tube for each bend. The angle through which the arm is rotated in making the bend is determined by a setting on the protractor in coordination with cam-stops, which are set to obtain the correct degree of bend or radius as distinguished from the angle of rotation. This provides an accurate stop for each bend and insures the uniform bending of identical or similar parts.

The tubing, cut to correct length, is slid over the mandrel and the radius block is adjusted to hold the tube firmly against the slide-block, as shown in Fig. 1. The operator

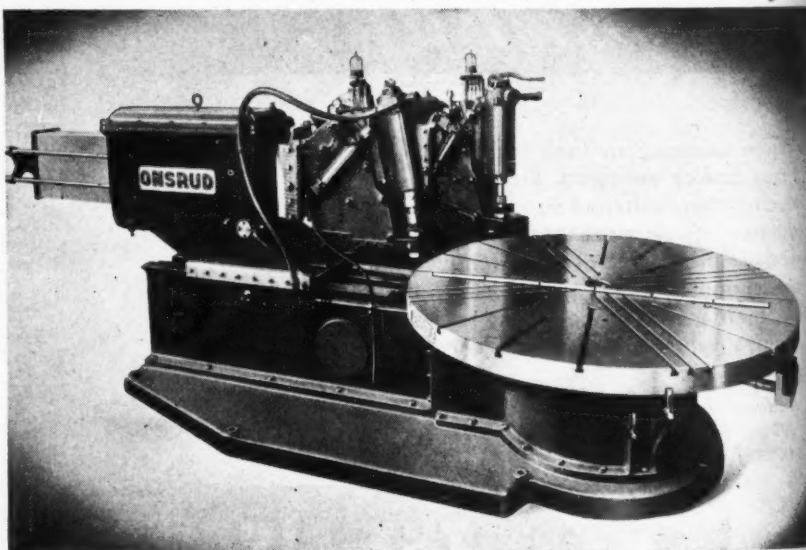
then begins the bending operation, using the hand-grip at the outer end of the radius-block clamping screw as a lever in the manner shown in Fig. 2. The large calibrated disk insures correct rotation of the tube for bends in different

planes. The white-faced dial records sequence of bends, while the black-faced dial registers stop positions when setting the cams. Under actual operating conditions, more than one thousand bends have been made per hour. The set-up time ranges from seven to fifteen minutes. 67

### Onsrud Large-Capacity Automatic Shaper

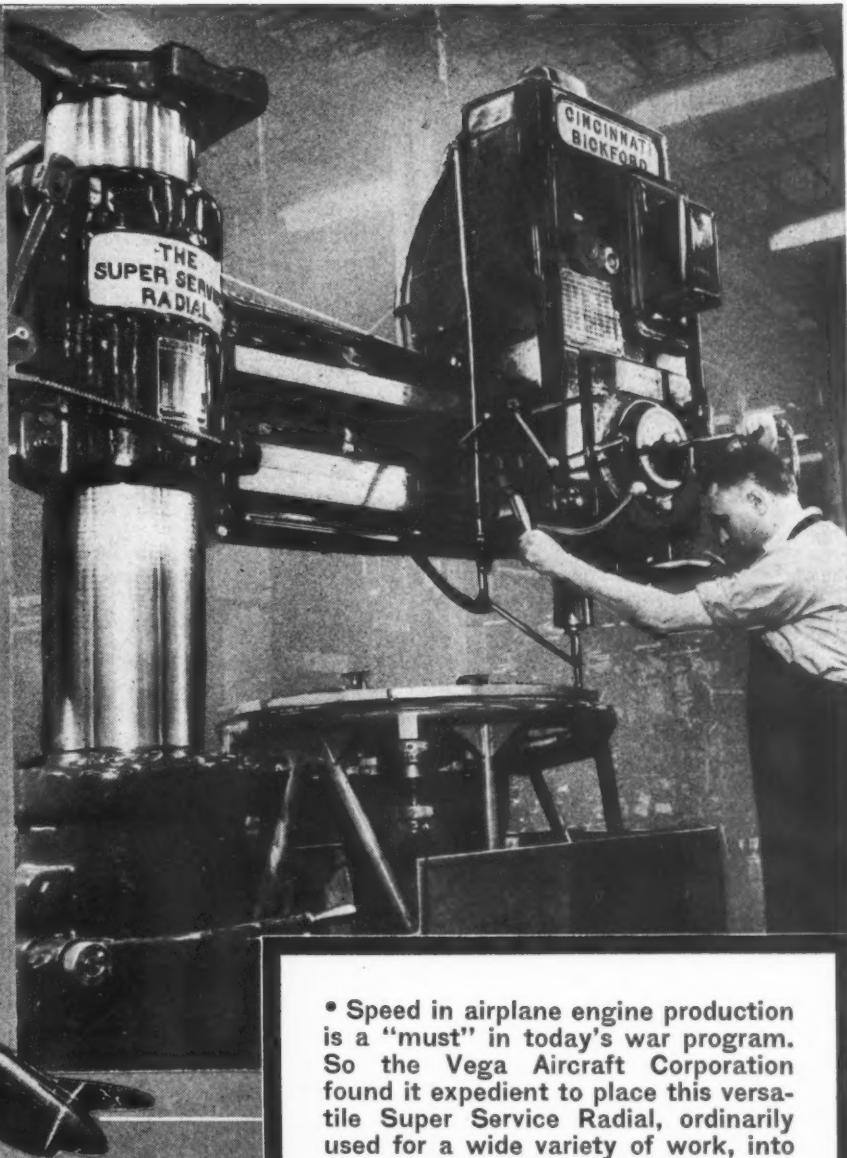
An automatic double-arm shaper of large size, designed for the high-speed forming or shaping of such parts as boat ribs, bulkhead sections, frames, etc., has been added

to the line of woodworking machines built by the Onsrud Machine Works, Inc., 3940 Palmer St., Chicago 47, Ill. This new WB-112 machine is the largest of its type to be



Onsrud Automatic Shaper with Templet Control for Varying Bevel Cut on Work





**MOTOR MOUNTS  
FOR VEGA AIRCRAFT  
drilled and reamed  
accurately in quantity  
lots...with a  
SUPER SERVICE RADIAL**

**The CINCINNATI BICKFORD  
TOOL COMPANY**

OAKLEY, CINCINNATI 9

OHIO, U. S. A.

• Speed in airplane engine production is a "must" in today's war program. So the Vega Aircraft Corporation found it expedient to place this versatile Super Service Radial, ordinarily used for a wide variety of work, into service on motor mounts.

Here we see the machine busy on this work. The motor mount is a ring about 3 1/2' in diameter. Six holes are drilled and reamed 15/16" through a 2" boss and also spot faced and countersunk on both sides. A tolerance of .0015" is easily held. Time is approximately three hours per piece.

One of the reasons why this machine has proved so serviceable on the work assigned to it lies in the fact that 18 rates of feed and 36 useful speeds are instantly available to operate cutting tools at maximum efficiency.

*You'll be interested in the whole story.  
Write for Bulletin R-24.*



placed on the market by the manufacturer. It has a turning capacity of 112 inches, and will handle work up to 79 inches square.

Each cutter-spindle rotates at 7200 R.P.M. under the direct drive of a 12 1/2-H.P., three-phase, 120-cycle motor. The entire cutter-head assembly tilts in one plane to either side of the vertical position up to a maximum angle of 10 degrees. The tilting is controlled automatically, and is varied by the use of special templates or pattern set-ups.

Each of the ram type cutter-arms has a maximum travel of 22 inches

on the radius line of the table. The machine can be set to reach any point 12 inches from the table center and up to 14 inches beyond the table edge. Work is fastened to the rotating table by pneumatic clamps controlled by an automatic safety switch. The rates of feed obtainable with the 84-inch diameter table range from 0.2 inch to 2 inches per revolution. The table feed is driven by a 2-H.P. General Electric Thyrotol unit with a 2-H.P. direct-current gearmotor. The Thyrotol unit permits stepless-speed rheostat control of the table feed. ....68

### Fitchburg Roller-Bearing Race Grinder

A roller-bearing race grinder employing a single standard Fitchburg Bowgage grinding wheel head unit has just been brought out by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass. The work-head of this grinder is adjustable from 0 to 75 degrees to adapt the machine for many straight or tapered grinding jobs. This grinder is completely automatic, the pressing of a single button causing the wheel-head to go through its standard automatic cycle of rapid traverse to work, grind at proper feed, spark out, and rapid return. Production work can be held to limits of 0.0002 inch.

The work-head can be arranged for either hydraulic or pneumatic operation of the collet clamping or chucking device. For truing in taper grinding, the wheel-head is mounted on a 45-degree slide. The truing device is mounted on the side of the base parallel to the wheel-head, and is hydraulically operated. ....69

### DoAll High-Speed Sawing Machine

Continental Machines, Inc., 1312 S. Washington Ave., Minneapolis 4, Minn., is manufacturing a new ver-

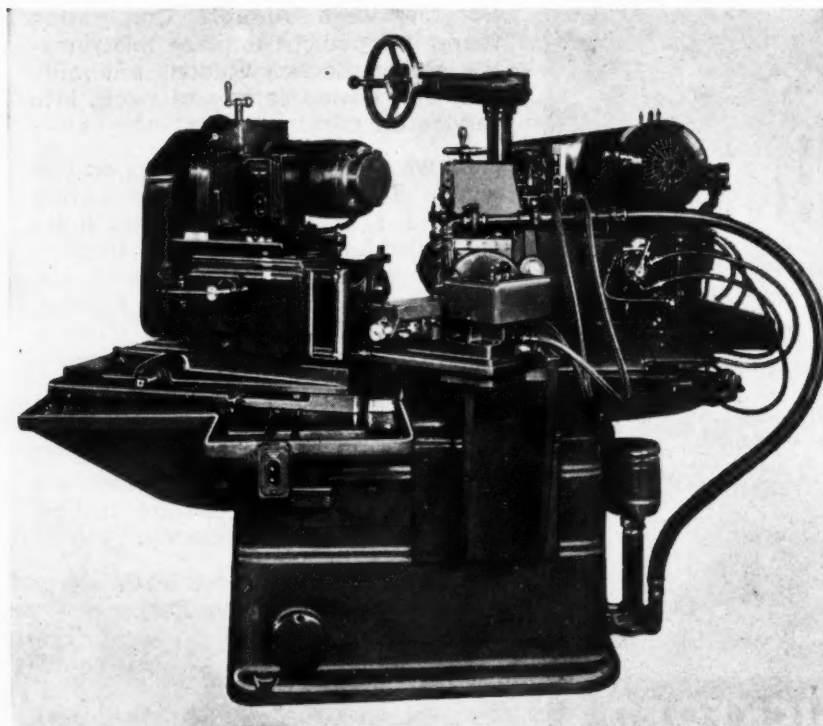


Do-All "Zephyr" All-purpose Sawing Machine

satile high-speed sawing machine especially designed for use in the fabrication of products made from the wide variety of light-weight materials now available. Contour sawing with this machine provides an economical method of shaping the new materials, the narrow saw bands being used to cut directly to internal as well as external lay-out lines. Multiple parts can thus be produced in one operation. Parts with three-dimensional shapes can be formed with a minimum number of cuts.

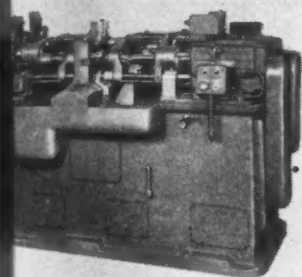
This machine, known as the Do-All "Zephyr," has a 36-inch throat depth, and a cutting speed range of from 1500 to 10,000 feet per minute. Stepless adjustment of the speed is provided by a Speedmaster variable-speed pulley to permit selecting the exact speed required for cutting a wide range of materials economically and at the same time obtaining the desired finish. A job-selector dial is provided which shows at a glance the control factors for the efficient shaping of 104 basic materials, including plastics, wood, asbestos, rubber, paper, sheet metal, non-ferrous castings, and cast iron, as well as a considerable number of alloy steels.

Standard equipment includes a 10-H.P. variable-speed drive and a 30- by 30-inch work-table with a secondary table extension 17 by 20 inches. The table can be tilted in four directions—45 degrees to the right and 10 degrees to the left, front, and rear. ....70

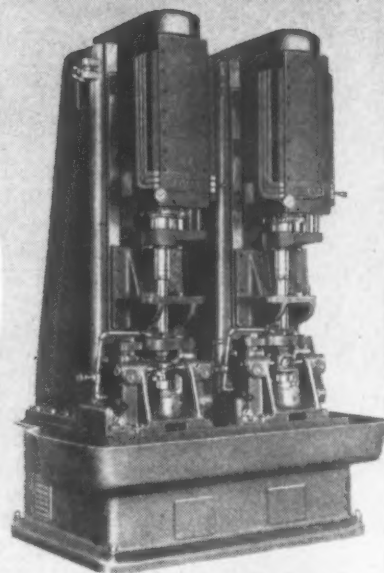


Fitchburg Roller-bearing Race Grinder



**XLO****EX-CELL-O for PRECISION**

Here is shown an instance where the Ex-Cell-O Small Hydraulic Unit (Style 21) is used on a machine for the accurate drilling of holes in oil pump bodies.



On this Ex-Cell-O double drill press, two Style 25-A Ex-Cell-O Hydraulic Units are mounted on the columns in vertical position. This has definite advantages on certain classes of work.

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**Production Machines  
equipped with Ex-Cell-O  
Hydraulic Units have  
numerous advantages**

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accuracy, and economy  
through multiple opera-  
tions are required—  
consult EX-CELL-O now

For the machine you build, or the machine we build, the use of Ex-Cell-O Hydraulic Power Units provides these features:

- They are compact, for proper design.**
- They are self-contained, for ease in installation.**
- They have infinite feeds, for proper cutting.**
- They have gear change, for proper speeds.**
- They have ample power, for multiple-head operation.**
- They have variable stroke, for greater flexibility.**

Ex-Cell-O Hydraulic Power Units are standard and produced in quantities, but in nearly every case where the unit is used it becomes a part of a special, high production type machine for a specific operation. These units are economical because, as applications change, the units can become a part of the new machine even though entire base is redesigned.

The units can be mounted on any plane—horizontally, vertically, or angularly—on a temporary or a permanent base, and they can be arranged so that it is possible to use them in connection with guide bars and multiple drill heads.

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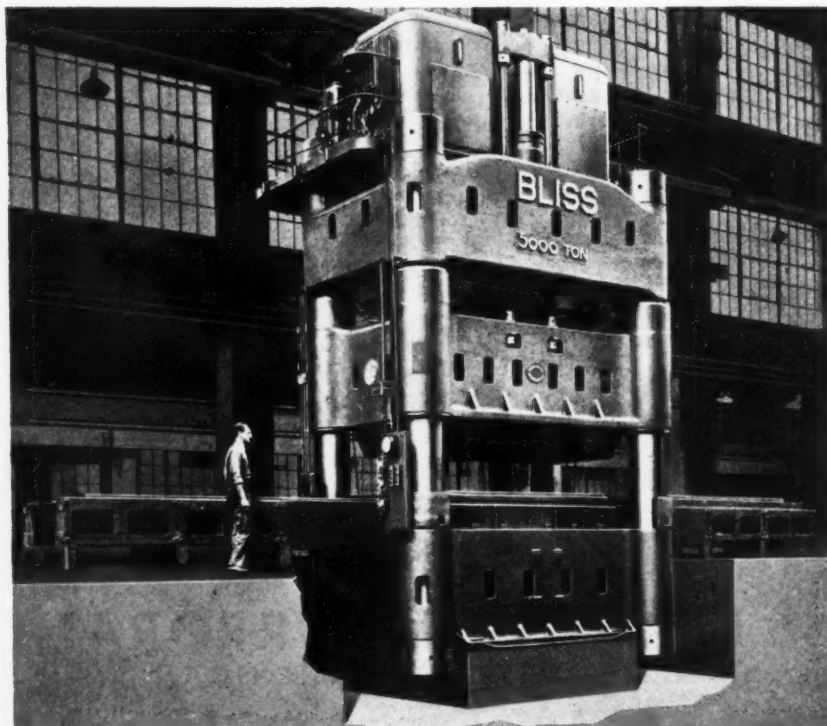


## Bliss 5000-Ton Capacity Hydraulic Press

A 5000-ton, two-die slide hydraulic press, said to be one of the largest and heaviest self-contained presses ever built, has just been constructed by the E. W. Bliss Co., Second Ave. and 53rd St., Brooklyn 32, N. Y., for application of the rubber die process in the aircraft industry. An outstanding feature of this press is its automatic cycle, in which the die slide moves into position in 4 1/2 seconds, the stroke being 168 1/16 inches. As soon as this slide is in position, the pressing cycle is completed, the pressure being independently adjustable for each die slide. At the completion of the pressing cycle, the die slide automatically moves out into the loading and unloading position.

This press has the Bliss universal electric control interlock safety feature. Provision is made for the addition of a third and fourth slide when required. Shockless electric drive of the die slides, accurate positioning and fitting of the die slide to the rubber pad, and twin hydraulic pumping units and circuits are also features of this press.

The pad is 50 by 144 by 12 inches, and the maximum stroke is 40 inches. The machine requires a floor space of 550 by 170 inches. It has a height of 30 feet 6 inches. 71



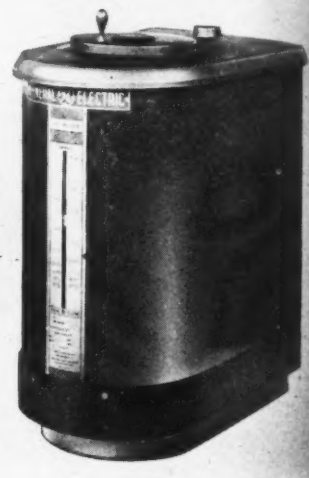
Huge Bliss Hydraulic Press Designed for Automatic Cycle Operation

## General Electric Outdoor Alternating-Current Welders and Electronic Welding Control

Two new outdoor alternating-current welders—a 500- and a 300-ampere type—have been announced by the General Electric Co., Schenectady 5, N. Y. The 500-ampere welder has a current range of from 100 to 625 amperes, while the range of the 300-ampere welder is from 60 to 375 amperes. Both welders are designed for use in shipyards or for other outdoor work where they are continuously exposed to the weather.

These welders are equipped with an "idlematic" control, which serves to reduce the output voltage automatically to less than 30 volts whenever the arc is not in operation, and yet provides full power for welding as soon as the arc is struck. They have all the important features of the General Electric indoor alternating-current welders of this type, including built-in power factor improvement, finger-tip adjustment, stepless current control, and fan-forced ventilation.

A new voltage regulator for use with most General Electric resistance-welding controls—known as CR7503-D157—which includes the phase-shift method of heat control is another development of the Industrial Control Division. This device is designed to regulate the



General Electric Outdoor Alternating-current Welder with "Idlematic" Control

welding current automatically, so that it is kept constant, regardless of line-voltage variations of as much as plus 10 or minus 20 per cent; hence, the quality of the weld is greatly improved and continuous readjustment of the heat setting is unnecessary.

When this regulator is in use, the electronic circuit not only keeps the average voltage of the resistor current constant, but also changes, electronically, the phase-control voltages of the main welding control panel. Thus, if the line voltage drops, the regulator advances the phase-control voltages, thereby automatically keeping the welding current constant within close limits. 72

## Pivot Type Precision Ball Bearings

Pivot type ball bearings made by Miniature Precision Bearings, Keene, N. H., are now available in sizes ranging from 2 to 10 millimeters outside diameter. These bearings are made from beryllium, stainless steel, or chromium steel, according to the application for which they are intended. The bearing races are machined from solid bar stock, and are highly finished. Each bearing is equipped with four balls of the same material as the cup and is fitted with a retaining cap. 73



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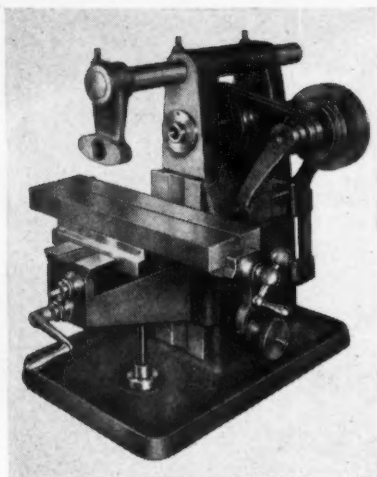
# CARBOLOY

TUNGSTEN CARBIDES \*\*\* TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



For Cutting  
**STEEL**





Bench Model Milling Machine  
Built by Diamond Tool Co.

### Diamond Bench Model Milling Machine

A new bench milling machine known as the Model B-12 has been added to the line built by the Diamond Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif. This compact machine weighs 435 pounds, and is said to be the largest bench type milling machine now manufactured. It has a 5 1/8- by 20-inch table with a longitudinal travel of 12 inches, a vertical travel of 9 inches, and a transverse travel of 6 inches. The heat-treated spindle is mounted in tapered roller bearings, and has a No. 9 B & S taper. A needle type bearing in the over-arm supports the arbor. The spindle has a speed range of 100 to 1400 R.P.M. 74

### "Bemisine" Angle-Setting and Measuring Device

A device, known as the "Bemisine," for setting or measuring any angle from 0 to 90 degrees within one minute of arc, has been announced to the trade by the Nichols-Morris Corporation, 50 Church St., New York 7, N. Y. This tool requires only a 2-inch micrometer and reference to the standard table of sines and cosines to determine the setting for any angle within its range in approximately one minute's time. It is being manufactured by the Boston Tool & Die Co., Brookline, Mass. All working surfaces are ground to a high finish, true and parallel, and suitable hand and positive locks are provided to retain accurate settings.

This device is actually a multi-purpose tool-room accessory, being adapted for holding small workpieces for grinding, machining, and inspection operations, as well as for measuring angles. It is recommended especially for use with grinding and jig boring equipment, where angular set-ups are usually difficult. It consists of a precision-ground right-angular base which supports an accurate drilled and tapped work-holding table measuring 3 1/2 by 4 inches. This table can be tilted to any angle up to 45 degrees. Settings for angles over 45 degrees are obtained by merely resting the fixture on the second side of its right-angular base and computing the complementary angle. Thus, an angle setting of 30 degrees with the device in the horizontal position

provides an angle setting of 60 degrees when tipped up at right angles. 75

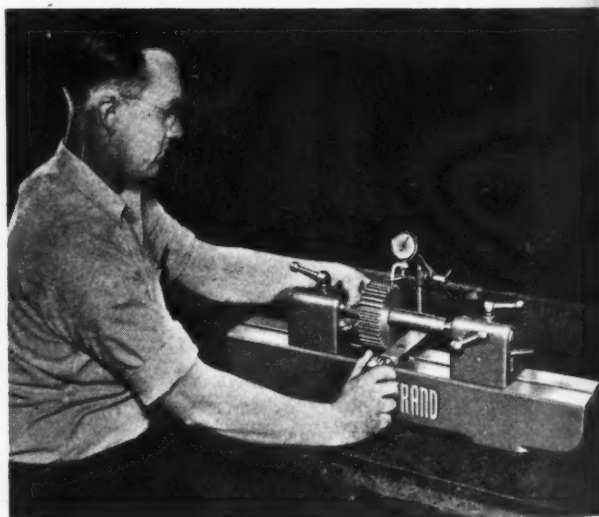
### Sundstrand Improved Bench Centers

An improved bench center designed to maintain accuracy within limits of 0.0001 inch in checking run-outs has been brought out by the Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill. The one-hand control feature of this bench center has been developed to simplify and speed up precision checking of work between centers. The one-hand control over all movable elements leaves one of the operator's hands free to position the part being checked. Unclamping and locking of both the left- and right-hand heads are easily accomplished by moving the top lever.

The center in the left-hand head is fixed, but the one in the right-hand head is spring-loaded and can be retracted by the end bar for quick loading and unloading. A front clamp on the right-hand head locks the center in position during the checking operation. The indicator support is manipulated by one hand when moving it away from the work to permit loading and unloading and against the work when checking for run-out. The bench center includes the bed and two heads as standard equipment, and is available in six sizes ranging from 6 by 18 up to 12 by 72 inches. A dial indicator with an adjustable holder is available as extra equipment. 76



"Bemisine" Angle-setting and Measuring  
Device for Tool-room Use



Improved Bench Centers for Testing Run-out.  
Made by Sundstrand Machine Tool Co.





# CONTROLLING THE POWER OF 2,000 HORSES

**T**ODAY'S aircraft engines are miracles of concentrated power. In the tapered nose of a fighting plane, the might of more than 2,000 horses is held in leash—ready at a touch of the throttle to carry the war to the enemy.

As engine horsepower has gone up—and up—and up, engine manufacturers have demanded gears of greater compactness and greater precision to carry these vastly increased loads.

Producing gears of sufficient accuracy to meet the demand of these super-engines was formerly possible by slow and tedious hand methods. But the problems presented in adapting these hand procedures to the manufacture of gears in quantities

sufficient to power the world's greatest air force meant a new approach to gear production.

The thousands of Pratt and Whitney engines in use in every theater of the war testify to the successful solution of these problems. For today, in the plants of Foote Bros. Gear and Machine Corporation, revolutionary methods of gear fabrication, heat treatment and quality control are assuring our air forces of high precision gears—in quantities.

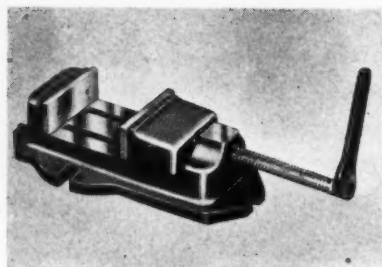
Translated into terms of peacetime production, these gears promise American manufacturers new economies in power transmission—new compactness in machine design.

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## FOOTE BROS.

*Better Power Transmission Through Better Gears*



Jenkins "Bar-Lok" Heavy-duty Vise

### "Bar-Lok" Heavy-Duty Vise

A quick-locking, heavy-duty vise of radically new design, called the Jenkins "Bar-Lok," has been developed by the Mechanics Engineering Co., Jackson, Mich. This vise is set and released by means of a "Bar-Lok" push-pull pressure unit, which has positive locking contact at four points and will develop a maximum clamping pressure of 20,000 pounds. Only a quarter-turn of the handle is needed to lock and release the vise, which is precision-built for heavy-duty work, especially for use on milling machines and drill presses. It is made in one size having a 4-inch opening, is 3 1/2 inches high, and has jaws 1 5/8 by 4 1/4 inches. 77

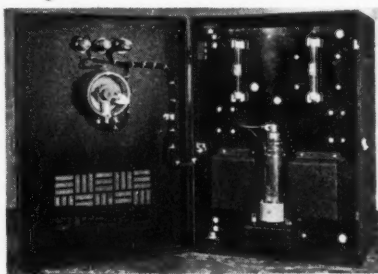
### Crescent Precision Gages

A complete line of precision gages designed to meet standard or special gaging requirements has been brought out by the Crescent Tool &

Die Co., 1469 Electric Ave., Lincoln Park, Mich. This line includes plug, ring, profile, flush-pin, snap, and built-up gages in a full range of standard sizes and tolerances. All types of gages in this line can be furnished in steel, chromium plate, or carbide to suit requirements. The chromium plated and carbide gages are designed especially for use on long production runs or for gaging parts made from highly abrasive materials. 78

### Westinghouse Spot-Welding Timer

A new precise welding timer with heat control for timing intervals of 1/2 cycle or less, as required for



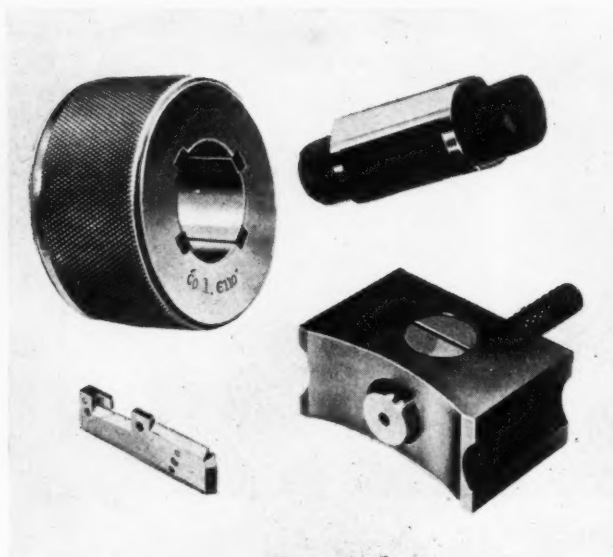
Westinghouse Spot-welding Timer with Accessible Swing-out Panel

East Pittsburgh, Pa. Precise control is obtained because the welding current is always started at the same point on the voltage wave for each operation. This new control, termed the SP-18, is designed for welding such work as radio-tube parts and sockets, pigtail resistors for terminal lugs, watch and instrument parts, contact tips on electrical relays, and other small parts.

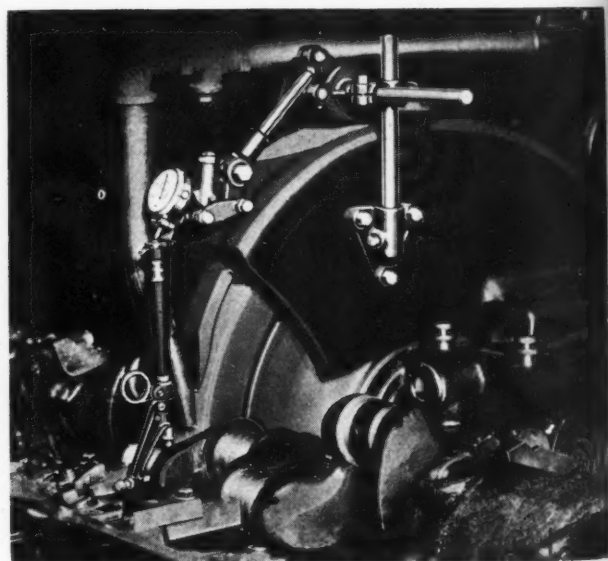
The timer is furnished as a separate control for use on existing small bench welders, and also in combination with a small welding transformer. Only one thyatron control tube is used, which serves the dual purpose of rectifying alternating current to charge a firing capacitor and of firing a small ignitron power tube. Heat control is accomplished by a phase shift method having an adjustment dial mounted on the cabinet door. 79

### Visual Diameter Control Grinding Gage

An improved Pratt grinding gage, which is designed to continuously measure the diameter of external cylindrical work while it is being ground, and which automatically indicates the point when the correct diameter is reached, has been placed on the market by the American Diamond Tool & Gauge Co., 7523 Fenkel Ave., Detroit 21, Mich. This improved gage provides a continuous visual check on out-of-roundness and indicates the amount of the



Crescent Precision Gages that can be Furnished in Any One of Three Materials



Pratt Visual Diameter Control Gage Made by American Tool & Gauge Co.



# **FEEDS FOR CUTTING TOOLS AREN'T RATIONED!**



**GIVE 'EM ALL THEY'LL TAKE!**



**USE THE FASTEST CUTTING SPEEDS AND  
HEAVIEST FEEDS POSSIBLE, ON EVERY JOB**

Good Turret Lathe practice dictates that easily adjusted tools should be run at speeds and feeds that require tool grinding every four hours.



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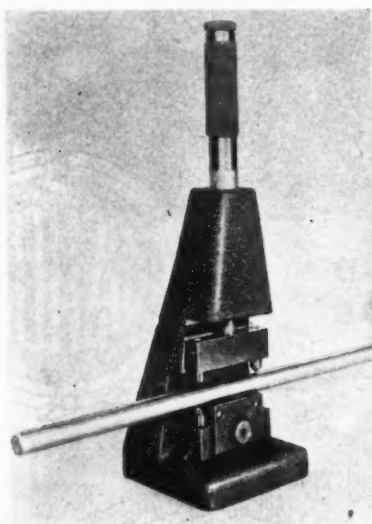
error. Roundness and accuracy of the diameter measurement within 0.0001 inch are said to be easily maintained, even when the gage is used by semi-skilled operators.

The gage is adapted for both straight and tapered work. The standard model, as illustrated, measures diameters from 5/16 inch to 27 inches. Special gages, such as required for side-wheel grinding operations, are made to meet individual needs. ....80

### Baldwin Gage-Point Punch

The Baldwin Locomotive Works, Philadelphia, Pa., has just placed on the market a gage-point punch for test specimens, which is double-acting and on which impact force is adjustable for different materials. It is designed to mark four uniform centers on a specimen with one push of the handle, and will automatically center either round or flat specimens. The impact force is applied manually by an adjustable detent, which eliminates the use of a hammer. The impact and size of the punch mark are adjustable to suit soft and hard specimens.

The upper punch-holder, guided in a heavy frame, is attached to the impact-adjustable handle. The entire upper punch-point assembly is spring-supported to maintain the gap between punch points at the open position for receiving the largest specimen. When a specimen is placed on the support, the upper handle is pushed down until all punch points rest on the test piece.

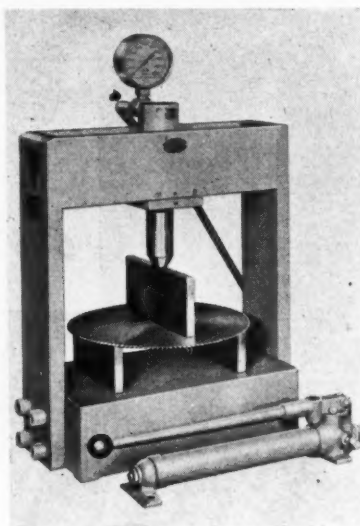


Baldwin Gage-point Punch  
for Impact Tests

A continued downward push on the handle brings to a preadjusted compression a second spring within the tubular handle, and releases the potential energy required for the impact test. ....81

### Anderson Laboratory Press

The new laboratory press here illustrated has just been added to the line of presses built by Anderson Bros. Mfg. Co., 1907 Kishwaukee St., Rockford, Ill. This press has a total capacity of 20 tons and a 5-inch stroke. The table is 12 by 20 inches. Power is furnished by a hydraulic hand-pump. In addition

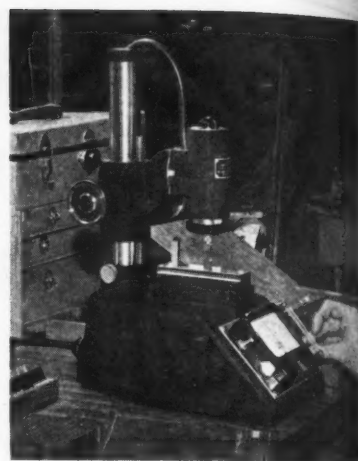


Laboratory Press Made by  
Anderson Bros. Mfg. Co.

to its use as a laboratory press, this unit can also be employed for many production straightening jobs on such work as large sprockets, gears, plates, etc. The press weighs 400 pounds. ....82

### DoAll Comparator with Four Magnification Ranges

Continental Machines, Inc., 1312 Washington Ave. S., Minneapolis 4, Minn., have brought out a complete line of DoAll comparators. The basic feature of the new comparator is its wide range of magnification, which enables one comparator to do work that formerly required as many as four models. To accomplish this, each comparator is provided with four magnification



Wide-range DoAll Comparator  
Brought out by Continental  
Machines, Inc.

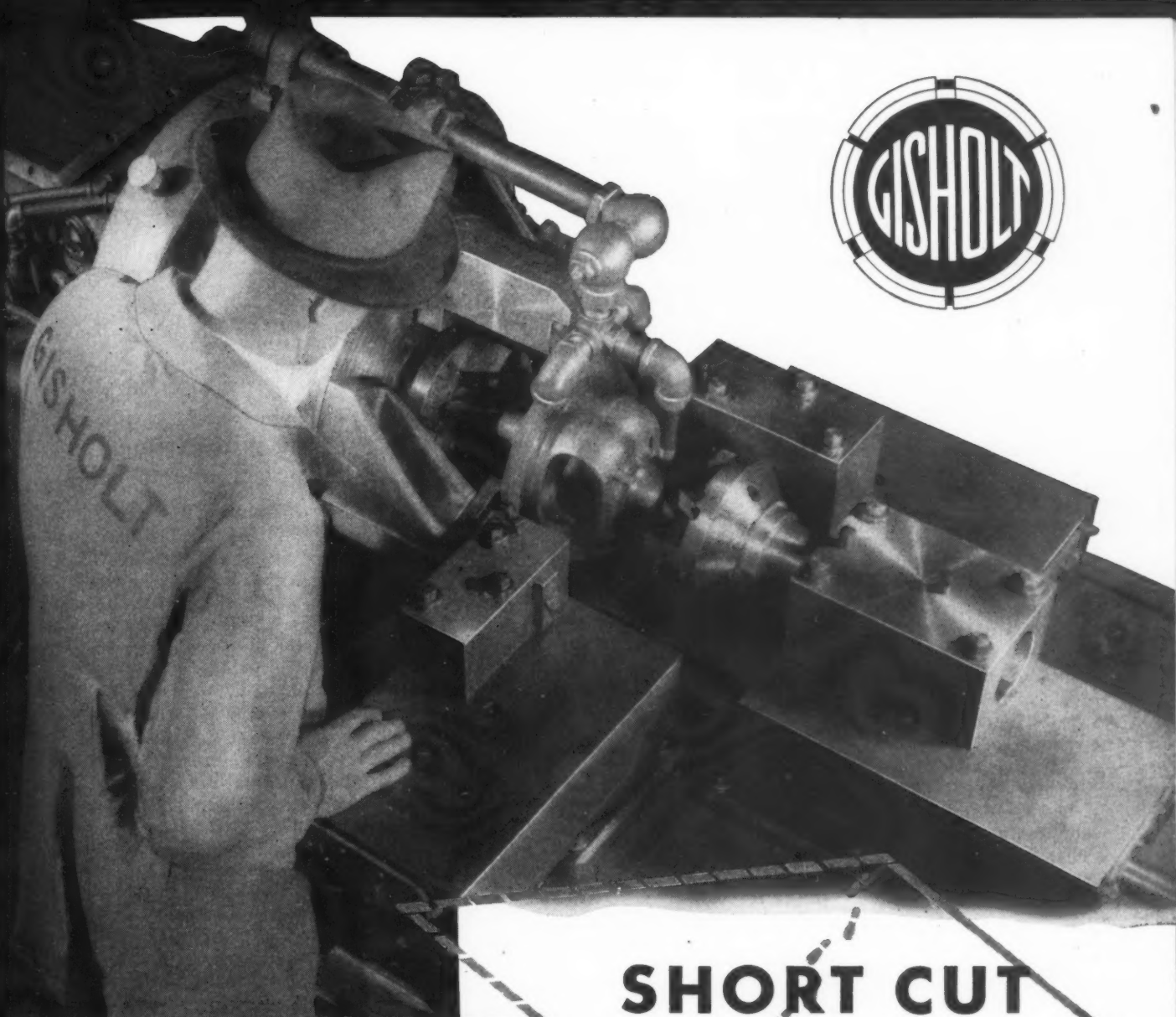
ranges, which enables work to be checked over a wide range of tolerances. For example, a work-piece can be checked with one of the new comparators to determine size variations of one-millionth inch, and with the same comparator, a work-piece can be checked to determine size variations as great as 0.0004 inch.

A feature of this instrument is variable-pressure adjustment for the spindle, obtained by means of a calibrated dial to provide the exact pressure required for measuring thick or thin sections, as well as for hard and soft materials. The spindle movement is magnified electrically, a feature that assures exact repeat readings. The spindle head is provided with an adjusting collar for raising the spindle to accommodate the work, and is also equipped with a hair-line adjustment knob for setting the indicating pointer on the comparator dial. The gage-head swivels 360 degrees in both horizontal and vertical planes, making it a simple matter to check irregular-shaped parts.

The Model 10 comparator will measure variations of from one-millionth to four-hundred millionths inch; the Model 20 will measure variations from ten-millionths to four-thousandths inch; and the Model 30 will measure variations from fifty-millionths to twenty-thousandths inch. ....83

### Florian Sine Angle-Plate

The Florian Mfg. Co., Plantsville, Conn., has brought out a sine angle-

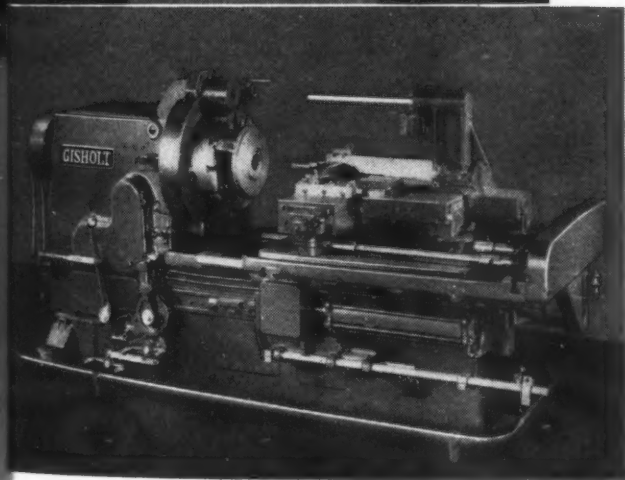


## SHORT CUT FOR THE LONG JOBS

WHEREVER the job calls for parts to be produced in large volume, Gisholt Simplimatics provide the swift, automatic machining cycle which short-cuts long, tedious hours and days.

In the machining operation illustrated above, for example, the Simplimatic turns two outside diameters of the workpiece; faces the flange; turns, faces, and chamfers the hubs on both ends; finishes the inner hub by means of tools operating through the spindle. And the whole job is handled, with one chucking only, in 1 1/4 minutes!

**GISHOLT MACHINE COMPANY**  
1209 East Washington Ave. • Madison 3, Wisconsin



### THE GISHOLT PLATEN TYPE SIMPLIMATIC

Permitting a wide variety of tool arrangements, these modern, fully automatic lathes also provide the extreme rigidity for multiple cuts to assure accuracy at high speeds. Easy to operate, one man can usually tend two, or even three, Simplimatics. No high degree of skill is required.

*Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning*

**TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES**

plate which simplifies the checking and grinding of accurate angles from 0 to 90 degrees. Accuracies up to four-millionths inch in one inch are claimed. This sine angle-plate is a complete unit, consisting of plate and base. It is distributed by the American Standard Co., Southington, Conn. .... 84

### Haynes Stellite Grooving and Cut-Off Tools

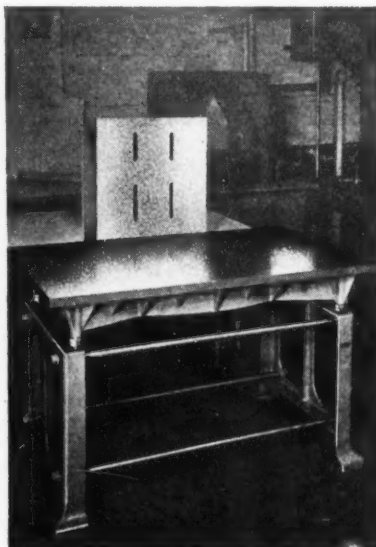
Grooving and cut-off tools of Haynes Stellite cobalt-base alloy are being made by the Haynes Stellite Co., unit of Union Carbide and Carbon Corporation, Kokomo, Ind. The grooving tools are finish-ground and lapped to specified tolerances, and the cut-off tools are ground to size, but are not lapped unless the purchaser specifies the lapped finish. Both types of tools can be obtained in either 98M2 or Star J-Metal alloy, the former being especially recommended for steel.

The grooving tools are furnished in three types—plain, channel, and I-beam—for operations on cast iron, aluminum, brass, bronze, and steel. The side lands are lapped to give maximum tool life. To resharpen these tools, it is necessary to grind the cutting end only, maintaining the front clearance angle.

The cut-off tools are made in two styles identified as Styles 1 and 2. Both styles are of the double-bevel type, the tapered sides providing side cutting clearances. A 6-degree angle is incorporated in the top and bottom edge of Style 2 to adapt it for certain cut-off tool-holders. Both styles are suitable for cut-off operations on tubing, cylinders, or hollow forgings of iron, brass, bronze, aluminum, and some steels. .... 85

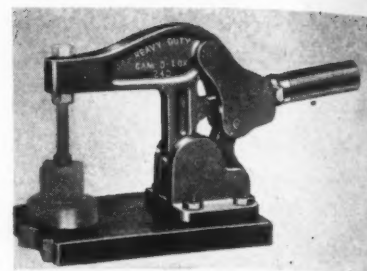
### Barco Combination Surface Plate

The Barco Scraping Co., 1975 E. 65th St., Cleveland 3, Ohio, has brought out a combination surface plate and angle-plate. The specially designed surface plate is 35 by 60 inches, and has a 24- by 32-inch plate pinned to one of its sides, forming an angle-plate. Both plates are hand-scraped to an accuracy of 0.0002 inch. The smaller plate is scraped on the top, face, and both sides, which are square with each



Combination Surface Plate and Angle-plate Made by the Barco Scraping Co.

other as well as with the larger plate. Both plates are of Meehanite, as is also the special table. The larger plate weighs 1650 pounds, the smaller plate 380 pounds, and the stand 325 pounds. .... 86



"Cam-O-Lok" Work-holding Clamp

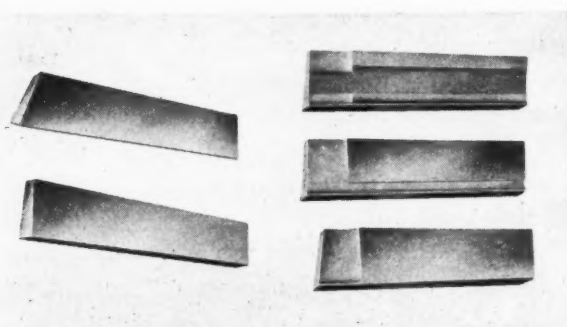
### Quick-Acting Work-Holding Clamp

The Mechanics Engineering Co., Jackson, Mich., has developed a new clamp designated "Cam-O-Lok," which is made in three types for light, medium, and heavy-duty clamping. This clamp is instantly adjustable over the entire range of its vertical holding capacity. When objects to be held vary in thickness, no adjustment of the hold-down bolt is necessary to obtain the desired clamping pressure.

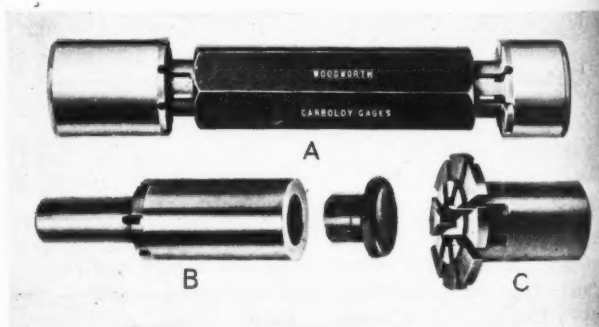
Locking and unlocking of this clamp are accomplished by means of a lubricated threaded element in the positioning handle. All parts of the clamp have been held to a minimum size to facilitate their use in assembling and holding fixtures where space is limited. .... 87

### Woodworth Carboly Gages with Segmented Shanks

A new type of Carboly gage with a segmented shank, which is claimed to be lighter in weight, better balanced, and capable of greater accuracy in inspection work than previous models, has been introduced to the trade by the N. A.



Haynes Stellite Grooving and Cut-off Tools Made of Cobalt-base Alloy. The Grooving Tools are Finish-ground and Lapped, and the Cut-off Tools are Ground but Not Lapped



(A) Woodworth Carboly Double-end Cylindrical Plug Gage with Segmented Shanks. (B) Woodworth Gage with Shock-proof Guide Cap. (C) Carboly Segmented Shank before Assembly to Carboly Gage



# Removed-35 cu. in. OF TOUGH STEEL PER MINUTE

## SUNOCO

### EMULSIFYING CUTTING OIL

**permits heavy cuts at high speed . . . saves tools and time**

When there's a lot of metal to be removed . . . in a hurry . . . that's a job for Sunoco Emulsifying Cutting Oil.

Take the operation shown below, for instance. The material was tough — S.A.E. 1045 steel; the cut was deep —  $\frac{3}{8}$ " ; and the speed was fast — 270 R.P.M. But with the help of Sunoco the job was done successfully . . . meeting every requirement of speed, finish and tolerance.

This operation is only one of thousands of difficult and exacting cutting jobs that every day are made easier by the use of Sunoco Emulsifying Cutting Oil. The exceptional heat-absorbing and lubricating character-

istics of Sunoco recommend it universally in shops where speed of production, fine finish, nth degree limits of tolerance, and tool economy are musts.

Probably in your shop, too, there are operations that could be improved and speeded up with Sunoco. Sun Engineers are at your service to help you with your machining problems . . . and prove to you under your own operating conditions the advantages of Sunoco. Contact your nearest Sun Oil Company office today, or write direct to . . .

**SUN OIL COMPANY • Philadelphia 3, Pa.**  
Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

#### PERFORMANCE DATA

OPERATION — Turning 5" diameter at 350 S.F.P.M.  
MACHINE — 18" x 54" American Pacemaker Lathe.  
MATERIAL — S.A.E. 1045 steel. FEED — .022".  
SPINDLE SPEED — 270 R.P.M. DEPTH OF CUT —  $\frac{3}{8}$  inch.  
CUTTING LUBRICANT — 1 part Sunoco to 20 parts water.

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WRITE FOR FOLDER ON  
SUN'S PLAN TO SAVE  
EQUIPMENT-TIME-LABOR  
WITH  
PROPER LUBRICATION

## SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

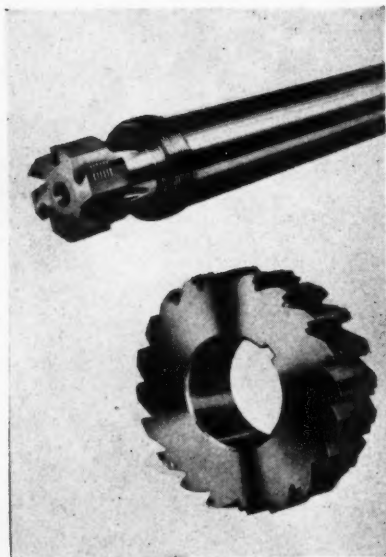
Woodworth Co., 1300 E. Nine Mile Road, Detroit 20, Mich. The segmented shank, as shown in the illustration, compensates for the difference in the coefficient of expansion between cemented carbide and steel.

The Carboloy plug gages of this design range in size from 0.510 inch to 1.510 inches. The segments, which are separated by slots, permit expansion or contraction resulting from temperature changes without distorting the Carboloy gaging member. Because of their lighter weight and better balance, they also reduce operator fatigue. 88

### Thread Milling Cutters with Carbide Inserts

A new line of carbide-insert thread milling cutters has recently been announced by the Plan-O-Mill Corporation, 1511 E. Eight Mile Road, Hazel Park, Mich. These cutters are available in National, Whitworth, Acme, vee, and special forms, both ground and unground, with straight or spiral flutes, and with or without provision for taking the Higbee cut.

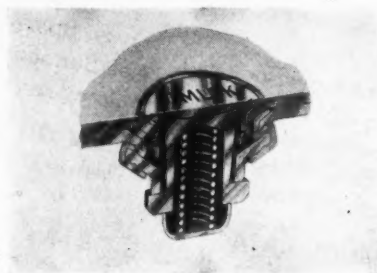
Among the outstanding advantages claimed for this new line of carbide-insert cutters are faster cutting, exceptional finish and accuracy, and longer tool life. It is claimed that the larger number of parts obtained per grind with these cutters results in a substantial reduction in tool and labor costs. 89



Carbide-insert Thread Milling Cutters Brought out by the Plan-O-Mill Corporation

### Improved Simlok Cowling and Panel Fasteners

The Simlok Division of the Simmons Machine Tool Corporation, 1600 N. Broadway, Albany 1, N. Y., has announced the incorporation of improvements in the design and construction of its Simlok fasteners for cowlings and panels. Like the earlier Simlok fastener (described and illustrated in October, 1943, *MACHINERY*, page 212), this improved design can be quickly fastened or unfastened by a quarter turn. The new fastener is manufactured in three sizes, and with flush, oval, and wing type heads.

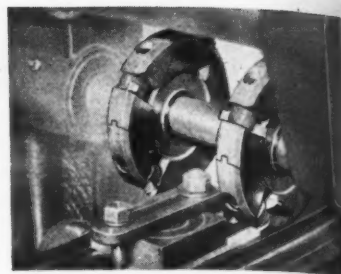


Cross-section of Improved Simlok Cowling Fastener

The tapered design of the fastener makes it particularly adapted for use in assembling curved sheets, such as engine cowlings. It completely eliminates side play and holds end play or spring deflection to a maximum of 0.008 inch, which is just enough to permit locking the fastener. To lock the fastener, two sheets are brought together so that the stud enters the fastener receptacle. The stud is then depressed against the action of the spring and turned until the locking lugs ride under the cam surface and lock in a seat in the cam. 90

### Newfield Universal Fly Cutter

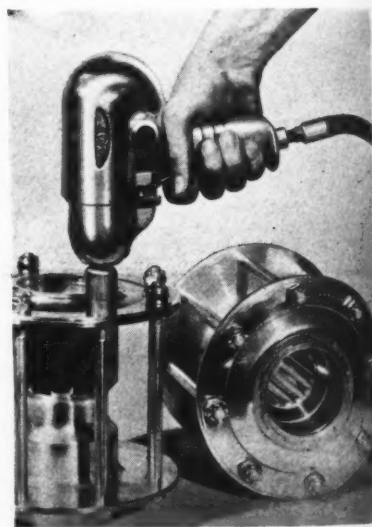
A single universal fly cutter utilizing standard high-speed steel or carbide bits, which is designed to do the work of many special cutters, has been brought out by the Newfield Machined Parts Co., 7160 Melrose Ave., Los Angeles 46, Calif. This tool is adapted for performing operations such as slotting, straddle and form milling, boring, flat surface milling, gear-cutting, etc. It can be used for machining plastics



Universal Adjustable Fly Cutter

and light metals, as well as steel, on horizontal and vertical mills and drill presses.

Standard bits of any type are inserted in the holders, which can be rotated 270 degrees at right angles to the shaft. This permits individual adjustment for both width and depth of cuts. Each bit is clamped in position by a single Allen screw. Preparation of the cutter for complicated forming cuts is simplified by grinding each bit for a portion of the cut. Thus each tool can be quickly adjusted to perform multiple duties. It is stated that the four or six bits used in the cutter generate less heat than is developed by a standard milling cutter. The cutter is available in four sizes—4, 6, 8, and 10 inches. These cover a range of bit capacities from 5/16 to 1/2 inch, and will cut widths of 5/8 to 1 inch. 91



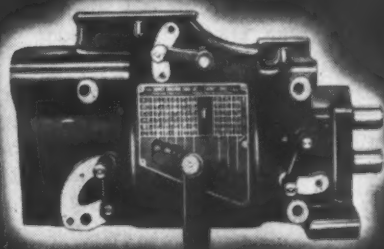
Impact Wrench Made by Aro Equipment Corporation

### Aro Impact Wrench

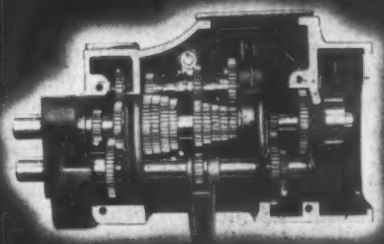
A 3/8-inch impact wrench that operates with controlled torque is announced to the trade by the Aro

# Sidney

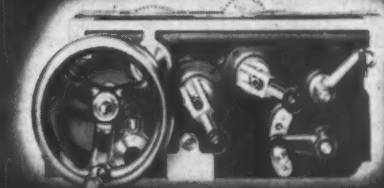
40TH ANNIVERSARY



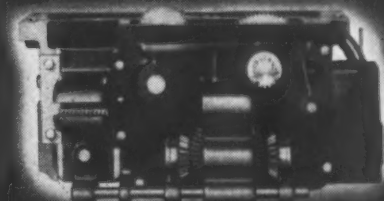
FRONT VIEW OF GEAR BOX



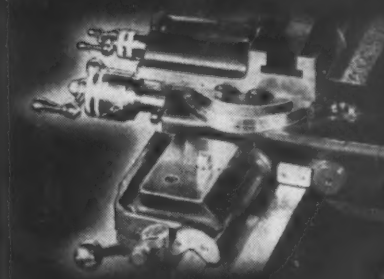
REAR VIEW OF GEAR BOX



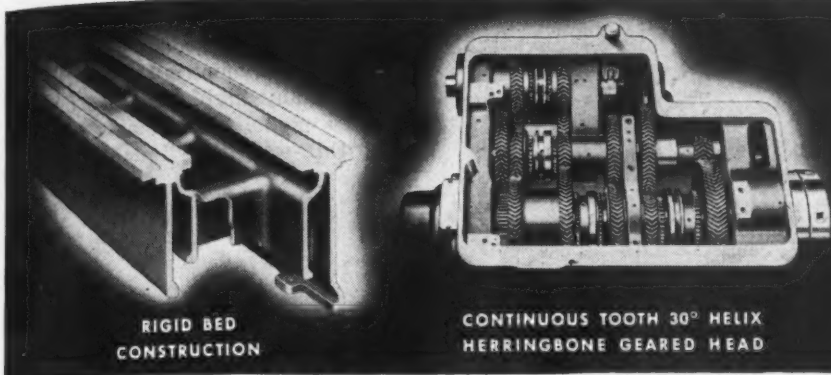
FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST



RIGID BED  
CONSTRUCTION

CONTINUOUS TOOTH 30° HELIX  
HERRINGBONE GEARED HEAD



Photo courtesy of Douglas Aircraft Company, Inc.

**Winged Victory demands speed and precision**

## SIDNEY LATHES

● It would be difficult to find work requiring closer tolerances than airplane parts and the vast number of Sidney Lathes used by manufacturers of aircraft parts and in aircraft plants is indicative of the accuracy and dependability of Sidney Lathes for precision work.

The rigidity of Sidney Lathe bed with its four walls and cross girts at twelve inch intervals—the continuous tooth Herringbone Geared Headstock—the husky controls located centrally at the operator's fingertips provide all the essentials of strength—smooth flowing power—and ease of operation—to produce close tolerance work—easily—quickly. If your work requires aircraft precision put it on a Sidney Lathe.

*Bulletins on all sizes available.*



**The SIDNEY MACHINE TOOL Company**

*Builders of Precision Machinery*

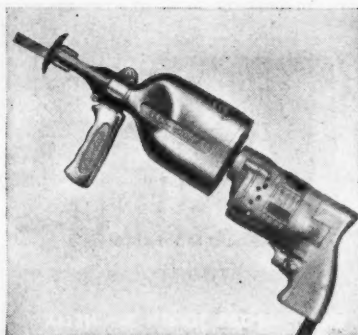
**SIDNEY**

ESTABLISHED 1904

**OHIO**



Equipment Corporation, Bryan, Ohio. This pneumatically powered tool, which the manufacturer states will prevent stretching or burning of threads, is capable of both forward and reverse rotation and has a calibrated adjusting screw on the side of the motor that enables the operator to set any bolt or nut within its capacity to the desired tension. The Model 131 wrench, having a capacity for handling work up to the 3/8-inch bolt size, is only 6 3/4 inches in length, and weighs 4 1/4 pounds. Regular equipment includes one socket and 8 feet of 5/16-inch hose and fittings. ....92



Electric Drill Equipped with "Saw Chief" Sawing and Filing Attachment

### Saw and File Attachment for Electric Drills

The Chicago Precision Equipment Co., 919 N. Michigan Ave., Chicago 11, Ill., has brought out a new attachment designated the "Saw Chief," which is designed to adapt electric drills for portable power sawing and filing operations on all kinds of metals, woods, plastics, and other materials. This attachment utilizes an ordinary hacksaw blade, which is clamped in the holder with the teeth toward the operator. When used as a power file, the file is simply inserted in

the chuck or holder in place of the saw blade.

Where electric power is not available, the unit can be driven by attachment to a compressed-air line or a flexible-shaft machine. ....93

### Sheffield Snap Gage for Use with Precisionaire

A new type of snap-gage spindle has been brought out by the Sheffield Corporation, Dayton 1, Ohio, for use with its Precisionaire instrument. This is said to be the first application combining the fea-

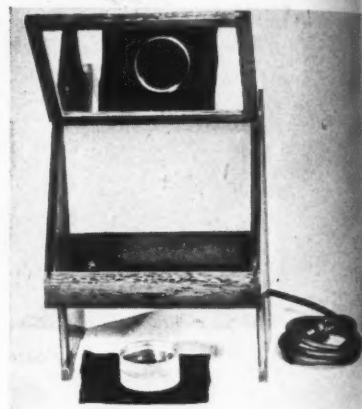


Sheffield Precisionaire Instrument Equipped with New Type Snap-gage Spindle. Insert Shows Close-up View of Snap-gage Spindle

tures of snap and air-flow gages. An outstanding advantage of this gaging equipment is that it will not scratch any highly finished or soft plated parts. It can also be used on thin-walled cylinders without danger of causing their collapse, and is especially adapted for checking work in the machine and inspecting parts that are too large or unwieldy to be presented to the gage. ....94

### Van Keuren Monochromatic Light

The Van Keuren Co., 178 Waltham St., Watertown 72, Mass., has announced the development of an improved laboratory monochromatic light. This light, as shown in the



Van Keuren Monochromatic Light for Precision Checking with Optical Flats

illustration, is intended for use in comparing gage-blocks for size and in checking optical flats and ultra precision surfaces where an accuracy of one or two millionths of an inch in the final result is important. With this equipment, monochromatic light is transmitted through a vertical ground glass screen and is reflected downward to the surface being inspected by a 45-degree inclined sheet of clear glass. The light is then reflected upward by the surface being tested and the optical flat, and passes directly through the 45-degree inclined glass. Here it is again reflected by a 45-degree inclined mirror to the eye of the observer.

The advantage of this new light is that the line of vision is nearly perpendicular to the surface being tested. The greater the distance the

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You know how quickly you turn out whiteprints of a draftsman's drawings. Well, it's that simple to reproduce office forms, reports, letters—even photographic material on positive film transparencies. You will save time, labor, and materials here, also.

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Ozalid is completely different from blue-

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Since no water and potash baths or driers are employed, **THE WIDEST VARIETY OF MATERIALS CAN BE USED.**

For example, you can order prints having black, blue, or maroon lines on a white background.

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Photographic material can be reproduced with striking effect on **OZALID**

DRY-PHOTO or **OZALID TWO-TONE** paper.

*MORE MATERIALS means MORE USES for MORE DEPARTMENTS.*

## IF YOU'RE NOT USING OZALID

- Add an Ozalid Dry Developer. Use with present printer and obtain all advantages.
- Install an Ozalid Whiteprint machine which prints and dry-develops. Available in all sizes.
- Write for catalog and booklet of Ozalid Whiteprints.

# OZALID PRODUCTS DIVISION

GENERAL ANILINE & FILM CORPORATION

Johnson City, New York

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL



MACHINERY, August, 1944—217

observer is from the surface being tested, the more nearly perpendicular is the line of vision on all points of the surface. This distance is limited only by the width of the room in which the light is being used. With the laboratory monochromatic light, light wave bands have their correct value of 0.00000116 inch per dark band. Thus, this monochromatic light gives true results to an accuracy better than a millionth of an inch. .... 95

### New Fleetweld Electrode

A general-purpose electrode for mild steel, known as "Fleetweld 35" and made specifically for operation on alternating current, has been brought out by the Lincoln Electric Co., Cleveland 1, Ohio. This shielded-arc electrode will also operate on direct current. It is available in 1/8-, 5/32-, and 3/16-inch sizes, and is made in the standard 14-inch lengths. .... 96

\* \* \*

### The War Job of the Automotive Industry

In dollar volume, current deliveries of war products by the automotive industry are approximately twice the figures reached in the peak peacetime production year. While the volume has doubled, profits measured against sales have been cut in half. On the other hand, the average weekly wages paid to employes have increased nearly 33 per cent, although the average number of hours worked per employe has gone up only 12 per cent.

Employment in the plants of automobile manufacturers and body builders is now 777,000, which is about 50 per cent more than the peacetime peak reached in June, 1941, of 514,000 workers. In grand total, during the entire preparedness and war period, the automotive industry has delivered some \$18,500,000,000 worth of war material.

\* \* \*

The National Bureau of Standards, Washington, D. C., announces that a commercial standard for dial indicators, identified as CS(E)119-45, has been accepted by industry and will be effective for new production beginning January 1, 1945.

## "Silentbloc" Vibration-Absorbing Mountings

A vibration-absorbing mounting which is performing important services in the automotive, aeronautical, and industrial machine and equipment fields, known as "Silentbloc," has been developed by the General Tire & Rubber Co., Mechanical Goods Division, Wabash, Ind. This type of rubber mounting fills three specific purposes: (1) It absorbs vibration; (2) it allows for torque action; and (3) it corrects misalignment. It is adapted to sustain four types of loads: (1) Axial loads, as in engine mountings; (2) radial loads, as in the case of ordinary bearings; (3) conical loads, with longitudinal support for angular movement within reasonable limits; and (4) torque loads, where there is twisting action, as in oscillating machinery such as agitators, vibrators, and washing machines.

The "Silentbloc" consists of two concentric metallic cylinders, one outside and one inside, which are firmly joined by an intervening layer of rubber under pressure, so that the three parts form a single mechanical unit. The firm bond between the rubber and the metal cylinders depends on mechanical adhesion rather than on a chemical

bond. This adhesion is due to the elongation of the rubber cylinder when it is compressed in the diametral direction. In assembly, the outside of the rubber cylinder is reduced and the hole in the rubber cylinder is enlarged. By varying the ratio of the opening of the inner to the closing-in of the outer diameter of the rubber cylinder, greater pressure can be produced on either the outer or inner metal cylinder, as required by the conditions.

In the making of "Silentbloc" units, any type of metal can be used for the metal cylinders. Ordinarily steel is employed, but aluminum cylinders are also frequently used. Rubber of different grades can also be employed — natural, synthetic, or reclaimed, according to the individual requirements.

Different types of mountings are made for almost every class of design and service. Some of the many mounting applications include printing and textile machinery; forging hammers; automobile engines; trolley car brake-gears; flexible couplings; farm machinery; compressors; pumps; turbines; conveyors; washing machines; refrigerators.

### Making Three-Dimensional Drawings

Trimetric drawings—a type of three-dimensional drawing — may soon be made with comparative ease in the ordinary drafting-room by the use of some newly developed methods devised by W. G. Wilkinson and H. C. Bartholomew, of the engineering department of the Glenn L. Martin Co., Baltimore, Md. The new developments include a photographic machine, which cuts 50 to 80 per cent from the time required to prepare a trimetric drawing, and four new drawing instruments.

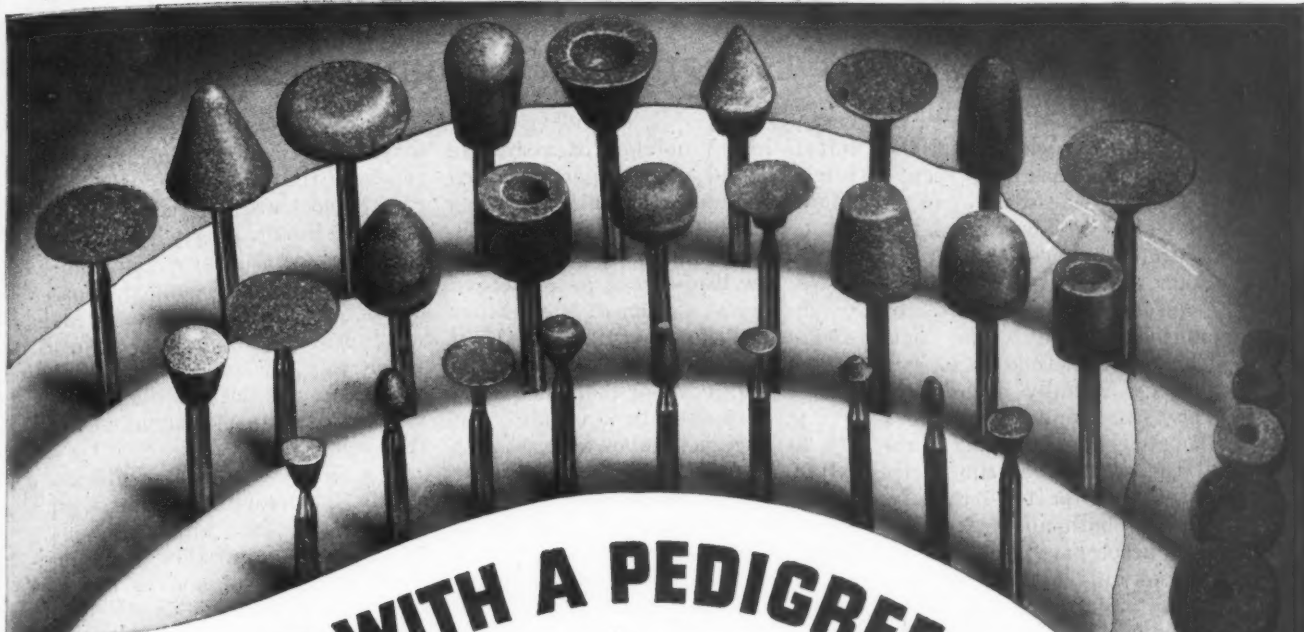
The new machine, known as the Martin "Axonograph," is a device for photographically translating the conventional drawing into a scale representation of one face of a trimetric projection. The other two dimensions or faces are then filled in by a draftsman, producing a trimetric drawing to scale in from one-fifth to one-half the time ordinarily required. By adjusting the machine and the position of the print on the copy board according to a predetermined scale, it is pos-

sible to produce a print in any of the trimetric planes—plan, face, or side—to fit the needs of each particular job. It is also possible to vary the scale as required.

The new drawing instruments developed are a trimetric scale with its three faces corresponding to the three axes of a trimetric drawing; ellipse templet; ellipse underlay; and trimetric protractor.

The principal advantage of the trimetric projection or drawing is in assembly work, where, due to its presentation as a perspective drawing with a minimum of distortion, it offers a far clearer picture of how the various parts go together than can be given by ordinary projection or by the other types of three-dimensional drawings, such as the regular perspective and isometric projections. The trimetric drawing in no sense replaces the regular projection drawings in manufacturing operations, but is simply a supplementary drawing that speeds and simplifies assembly work.





# THE BOND WITH A PEDIGREE..

## FV

A thousand test formulas—hundreds of bonds of various kinds—fifty years experience making bonds for the world's best grinding wheels—this is the Pedigree behind the new FV Bond.

FV Bond holds wheel shapes firm even when run at high speed, and produces a satin-like finish that is so accurate it passes any surface analyzer test hands down.

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Today's precision instruments and tools as well as mass production of way equipment parts, call for finishes with closer tolerances than ever before—finishes that can be measured in micro inches. Just any old wheel won't do. That's why this better bond—FV—was developed for all Chicago Wheels. There's a best grain, grade, size and shape wheel—all made with FV Bond — for each kind of material to be finished — a whole army of Chicago Wheels at your service.

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All the most needed shapes, each mounted firmly on its own steel shank to last as long as the wheel itself.

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☐ Send Test Wheel. Size .....

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# Lead-Screw Nuts Designed to Eliminate Backlash

THERE are two general methods by which backlash between a lead-nut and a lead-screw can be eliminated. One involves a relative axial movement between the nut and screw such that, in effect, the nut lead is caused to become greater by an amount equivalent to the backlash. The other method is to contract the nut radially around the lead-screw, thus tending to give a closer fit between the threads of the nut and the screw over the entire circumference or part of the circumference of both nut and screw.

In the accompanying illustration, fourteen different methods are shown for eliminating backlash. The first eight employ the axial method of adjustment, while the remainder are examples in which radial contraction is employed.

Fig. 1 shows a very common type of adjustment employed on tools, jigs, fixtures, machine vises, and some instruments. A slot is milled through a section of a nut and a hole is tapped to accommodate a round-head screw. The section to be flexed axially should be sufficiently narrow so that no undue stress is required to flex it. Also, the portion that is to guide the lead-screw should be long enough to give a good bearing.

The form or adjustment shown in Fig. 2 has been incorporated in the elevating screw for positioning the stage of low-priced microscopes. The stage portion is indicated at A, and to it is fastened the index spring B. The backlash adjusting

nut C has V-notches of very fine pitch around the periphery, which engage the index spring B. Between nut C and stage A is inserted a rubber ring D. When any play is present in the lead-screw, as evidenced by the radial motion of the vernier dial relative to a vernier plate (not shown), the nut C is turned clockwise through one or more notches.

Fig. 3 represents a variation of the arrangement shown in Fig. 2. After the adjustment has been made, nut A serves to clamp the adjusting bushing B rigidly in place. This type of adjustment is employed when the lead-screw is required to move heavy loads or operate against heavy thrusts. It should be noted that the thread on the outside of bushing B must be of a different pitch from that of the lead-screw. If the thread on the outside of the bushing is coarser than that on the screw, a small radial movement of the bushing will take up the backlash, while, if the thread is finer than that of the screw, a greater radial movement of bushing B will be required.

A self-compensating means of removing the backlash in a screw is illustrated in Fig. 4. It comprises the screw-bearing portion at A, which serves to move the load. In this actuator nut is milled a guide slot B for the sliding nut C. This sliding member is held in place by means of stud D. Between nut C and the bearing portion A is interposed the spacer block E. This block has a hole at F which allows for

ample vertical movement before touching the lead-screw. Both sides of this block are tapered. The inner faces of the bearing portion A and the slide nut C are correspondingly tapered. Directly below the spacer block E a hole is counterbored in member A to accommodate spring G. When any backlash develops, this spring forces block E higher, thus moving bearing A and nut C further apart.

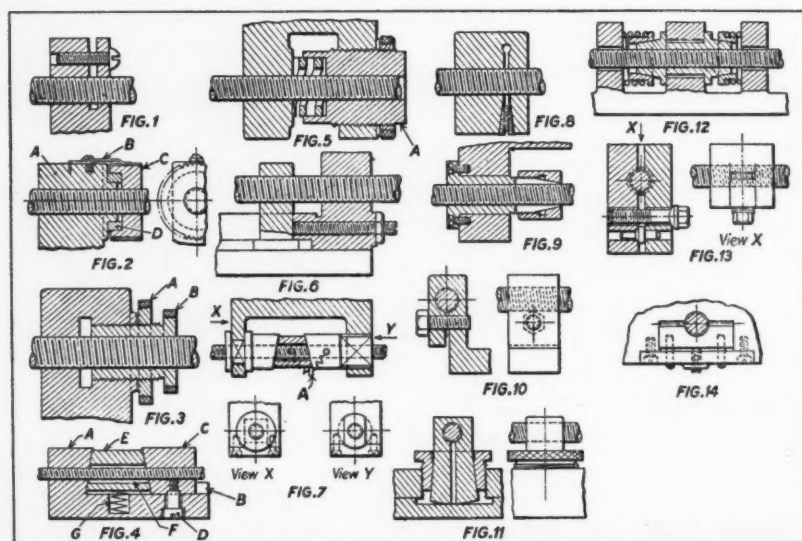
Fig. 5 represents a modification of Fig. 2 employed for transmitting heavy loads. Two flats A are milled on the lead-out to allow for adjustment by means of a wrench.

In Fig. 6 is shown a modification of Fig. 4. Here the relationship between the actuator nut and the adjusting nut is controlled manually by means of a set-screw, which is then locked in place.

Another modification of Fig. 4 is seen in Fig. 7. In this instance, the tapered spacer block is rotated by the tension of spring A. Views X and Y show how the front and rear halves of the nut are restrained from rotating. The flanges on the front half of the nut prevent it from moving axially, while the rear half of the nut is free to move in the axial direction.

Fig. 8 is a modification of Fig. 1. Here the flexible section is expanded instead of contracted.

The first of six different methods of radially contracting the nut upon the lead-screw is shown in Fig. 9. Here the nut is solidly bolted to the member to be moved. The inner end



Figs. 1 to 8. Methods of Taking up Backlash in Lead-screws by Relative Axial Displacement of Part of the Nut. Figs. 9 to 14. Methods of Taking up Backlash in Lead-screws by Radial Contraction of the Nut

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# MACHINERY'S DATA SHEETS 519 and 520

## COMMON WELDING TROUBLES—CAUSES AND CURES. 5

Trouble	Cause	Cure
<b>Corrosion</b>	(1) Type of electrode used. (2) Improper weld deposit for corrosive media. (3) Metallurgical effect of welding. (4) Improper cleaning of weld.	(A) Bare type electrodes produce welds that are less resistant to corrosion than the parent metal. (B) Shielded arc type electrodes produce welds that are more resistant to corrosion than the parent metal. (C) Do not expect more from the weld than you do from the parent metal. On stainless steels, use electrodes that are equal or better than the base metal. (D) In welding 18-8 austenitic stainless steel, be sure the analysis of the steel and welding procedure are correct, so that welding does not cause carbide precipitations. This condition can be corrected by annealing at 1900 to 2100 degrees F. (E) Certain materials, such as aluminum, require careful cleaning of all slag to prevent corrosion.
<b>Magnetic Arc Blow</b>	Magnetic fields cause the arc to blow away from the point at which it is directed. Magnetic blow is particularly noticeable with direct current at ends of joints and in corners.	(A) Proper location of the electric ground terminal on the work. Placing the ground in the direction the arc blows from the point of welding is often helpful. (B) Separating the ground into two or more parts is helpful. (C) Weld toward the direction the arc blows. (D) Hold a short arc. (E) Change magnetic path around arc by using steel blocks. (F) Use alternating-current welding.

MACHINERY'S Data Sheet No. 519, August, 1944

Compiled by C. H. Jennings, Welding Engineer  
Westinghouse Electric & Mfg. Co.

## IDENTIFICATION SYMBOLS FOR HIGH-SPEED STEEL TOOLS

Adopted by the Ford Motor Co. and General Motors Corporation

All high-speed steels in which tungsten is the major alloying element are designated by the letter "T." All high-speed steels in which molybdenum is the major alloying element, even though tungsten is present, are designated by the letter "M."

Tungsten High-Speed Steels—"T"					Molybdenum High-Speed Steels—"M"						
Chemical Composition, Per Cent				Analysis Symbol	Chemical Composition, Per Cent						Analysis Symbol
Tungsten	Chromium	Vanadium	Cobalt		Molybdenum	Chromium	Vanadium	Tungsten	Cobalt	Boron	
18.00	4.00	1.00	.....	T-1	8.00	4.00	1.00	1.00	.....	.....	M-1
18.00	4.00	2.00	.....	T-2	5.00	4.00	1.50	6.00	.....	.....	M-2
18.00	4.00	3.25	.....	T-3	8.00	4.00	2.00	.....	.....	.....	M-10
18.00	4.00	1.00	4.00	T-4	8.00	4.00	1.00	.....	2.50	Added	M-20
18.00	4.00	2.00	8.00	T-5	8.00	4.00	1.00	1.50	4.00	.....	M-30
22.00	5.00	1.50	12.00	T-6	8.00	4.00	1.50	.....	8.00	Added	M-40
14.00	4.00	2.00	.....	T-7	.....	.....	.....	.....	.....	.....	.....
14.00	4.00	2.00	5.00	T-8	.....	.....	.....	.....	.....	.....	.....

The following letter symbols have been assigned to denote the various manufacturers of domestically produced, commonly encountered brands of high-speed steel.

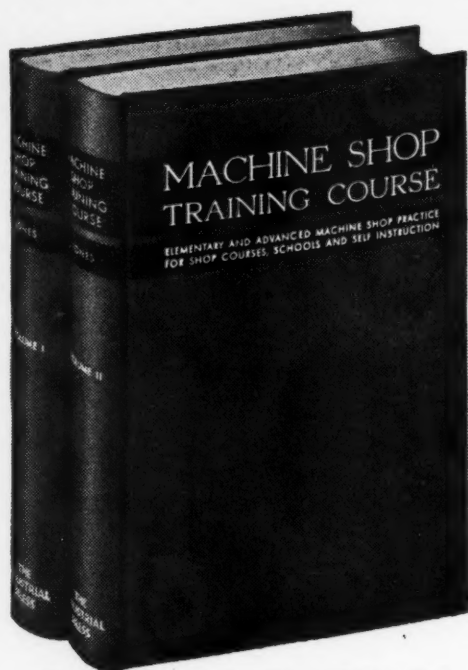
Symbol Identifying Manufacturer	Manufacturer	Symbol Identifying Manufacturer	Manufacturer
A	Vanadium-Alloys Steel Co.	I	Braeburn Alloy Steel Co.
B	Firth-Sterling Steel Co.	J	Halcomb Steel Co.
C	Henry Disston & Sons Co.	K	Carpenter Steel Co.
D	Universal Cyclops Steel Co.	L	Midvale Steel Co.
E	Bethlehem Steel Co.	N	Simonds Saw & Steel Co.
F	Latrobe Electric Steel Co.	P	Vulcan Crucible Steel Co.
G	Allegheny Ludlum Steel Corporation	W	Jessop Steel Co.
H	Columbia Tool Steel Co.	X	Crucible Steel Co.

Example: If a tool is made from an 18-4-1 analysis steel supplied by the Vanadium-Alloys Steel Co., the tool will be marked T-1-A.

MACHINERY'S Data Sheet No. 520, August, 1944

Published in "Production Information" by  
the Automotive Council for War Production

# Machine Shop Training Course



**Price \$6 Set—Payable \$2  
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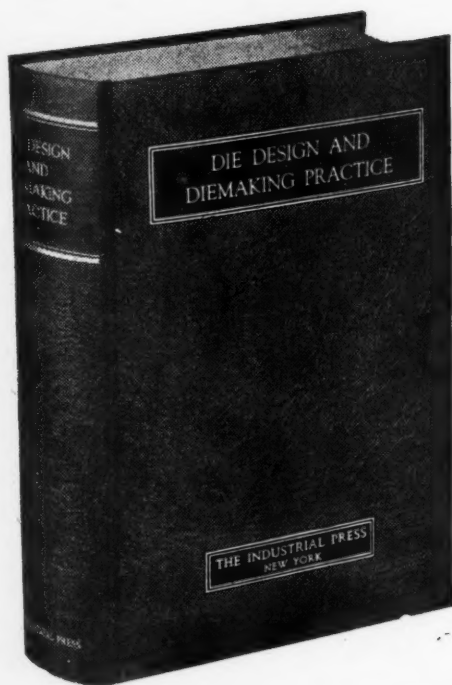
## WITH BLUEPRINT READING CHARTS

This standard treatise on machine shop practice in two volumes is for the shop man who wants to supplement his own experience with a broad fund of practical knowledge; for use as a textbook and guide in shop training courses; for technical or trade schools; for designers who want the fundamentals of machine shop practice; for mechanical engineering students.

The MACHINE SHOP TRAINING COURSE contains over 1100 pages of questions and answers. These questions deal with the elements of machine shop practice and other subjects closely allied to the work of the shop. The answers are packed with useful facts, shop rules, typical shop problems and their solutions. 524 drawings and photographs illustrate all kinds of machining operations, cutting tools, gages, etc.

**THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.**

# Die Design and Diemaking Practice



If you design, make or use dies for blanking, forming or drawing sheet-metal parts, here is a veritable die designer's and diemaker's bible. This die book presents not only descriptions and drawings of a tremendous variety of dies, but a vast amount of data representing a lot of boiled down and costly die experience. Dies of the same general classes are grouped together in chapters. The drawing dies have been placed into chapters according to the general shapes of the parts produced, to facilitate finding the type of die for producing a given shape. Price \$6—payable if desired \$2 with order and \$2 monthly for two months.

**956 pages, 590 illustrations**

**THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.**







of the nut is tapered and provided with an external thread, as well as with a number of slots. A clamp nut having a tapered bore to fit the taper on the lead-screw nut contracts the inner end of the latter, eliminating backlash. The clamp nut is made from hexagon stock.

Fig. 10 represents a very common means of contracting the nut around the lead-screw.

A method of removing backlash in an assembly where the two outboard ends of the screw are rigidly supported and the moving member is operated between the supporting members is shown in Fig. 11. The nut is split, tapered as shown, and formed with a rounded end. The object of this is to maintain as nearly as possible a fixed distance between the end of the nut and the center line of the screw, so that as the nut is clamped, little or no springing of the screw will occur. By turning the clamp nut, the lead-screw nut is contracted.

A means of automatically obtaining adjustment for any backlash between a nut and screw is illustrated in Fig. 12. The nut proper is of the split type and is flanged on each end; between the flanges it has a square outer form. The upper

halves of all three supporting members are separate caps, held in place by suitable screws (not shown).

In Fig. 13, a separate piece is shown inserted in a slot in the side of the nut. This is located by a peg, and adjustment is effected by means of a screw.

Fig. 14 is another construction based on the half-nut principle. Here the nut bearing is equal to the width of the inserted sliding piece. Tightening up of a screw clamps the movable section more firmly against the lead-nut.

\* \* \*

### Method of Preserving Drawings

A simple and economical method of condensing and preserving drawings or other records for an indefinite period of time has been developed by the Microcopy Corporation, 2800 W. Olive Ave., Burbank, Calif. The process is an application of microfilming to engineering drawings, maps, and other materials kept in the files of a manufacturing plant. The reduced photographs of the drawings are made on a continuous roll; thus there is less

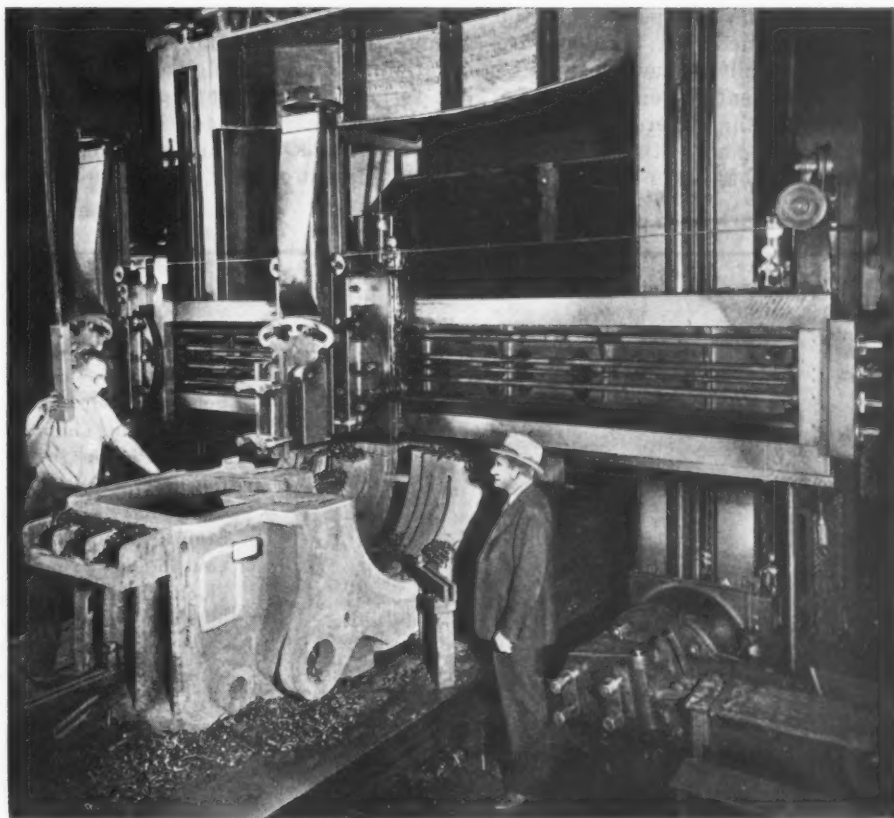
likelihood of losing individual negatives. The negative can be used to make copies on other films, and can be employed for copies of the original in any size desired, whether actual, larger, or smaller. These copies can be made on tracing paper, cloth, or film. For inspecting or reading Microcopy photographs, a Multiple Magnification Viewer is available in various models.

\* \* \*

### Motion Picture on Welding Procedure

A film prepared by the Navy Department on welding in aircraft production contains much of interest to all manufacturers who use spot-welding and other forms of resistance welding. It shows how production can be speeded up by the use of welding, both in war production and in making post-war products. The film, while designed for restricted use, is now being exhibited by various sections of the American Welding Society, 29 W. 39th St., New York City. The Society expects to be in a position to make the film available to manufacturers who would like to show it.

A 12-foot Planer which was Exhibited at the World's Columbian Exposition in Chicago in 1893 has been Reconditioned at One of the Plants of the General Electric Co., and is now Helping to Turn out the Propulsion Equipment for Combat and Cargo Ships. In Rebuilding the Machine, it was Provided with Many Modern Improvements, including Electric Push-button Control for Moving the Tool-head and Cross-rail





## Billings & Spencer Co. Marks Seventy-Fifth Anniversary

The Billings & Spencer Co., Hartford, Conn., well known in the field of forgings and forged tools, celebrates its seventy-fifth anniversary this year. It was in 1869 that C. E. Billings and C. M. Spencer formed this company for the purpose of making, among other things, forged parts for high-grade guns. In order to carry on this work in an advantageous manner, they found it necessary to build some of their own machinery, and therefore set about not only to make forgings, but also to build the forging equipment necessary to make their product.

Since the forgings and tools produced with hammers that they had themselves built attracted wide

attention because of their quality, demands were made upon them to build drop-hammers for the trade as well. Thus, in the early years, the company not only made forgings, but also manufactured and sold forging machines.

It is of interest to note that both Mr. Billings and Mr. Spencer were men who had learned the machinist's trade at the bench, and had been employed as journeymen mechanics by some of the leading machinery and machine tool builders of that early day. With their skill they combined an inventive ability that furnished the groundwork for the new and better methods by which the company gained newer and better results.

## War Production Bottlenecks

While in most lines of manufacture the needs of the war effort are now being satisfactorily met, there are certain fields in which there are still shortages or "bottlenecks." One of these fields is that of heavy castings and forgings. Another is that of electronics. Ball bearings have proved a continuous bottleneck throughout the war period. In the fields mentioned, the backlogs are small, and full production will be required the entire year.

The fact that there have been cancellations and cutbacks merely indicates a change in the require-

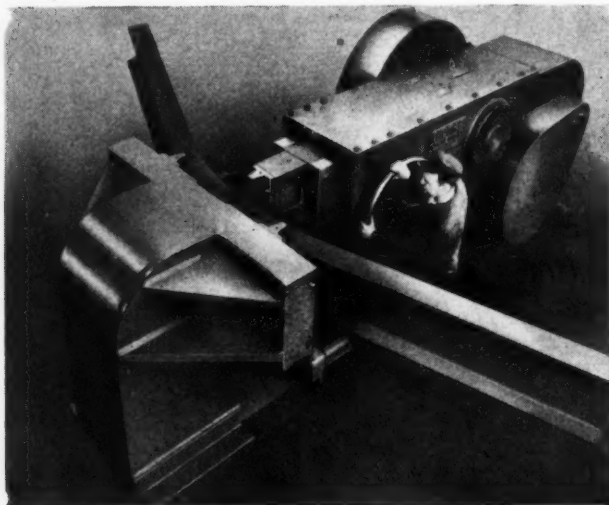
ments. We may have reached a satisfactory level in regard to certain weapons and types of equipment. In other fields, again, we need new weapons and equipment at an increasing rate. Furthermore, some equipment is used up faster than was expected, while other types of equipment are not used up as fast. This necessitates changes in contracts and some cancellations. These changes are not due to lack of intelligent planning. They are chiefly due to the changing conditions that are a normal accompaniment of warfare.

## Resistance Welding Developments

In a statement recently made by Floyd E. Taylor, president of the Resistance Welder Manufacturers' Association, attention was called to the tremendous advances in resistance welding technique on all types of metal which have been made in connection with war equipment manufacture. These new methods are equally applicable to a wide variety of products—from fine instruments to heavy machinery manufacture—for peacetime purposes. "Actually," said Mr. Taylor, "there are few types of metal products in the production of which resistance welding processes will not play increasingly important roles."

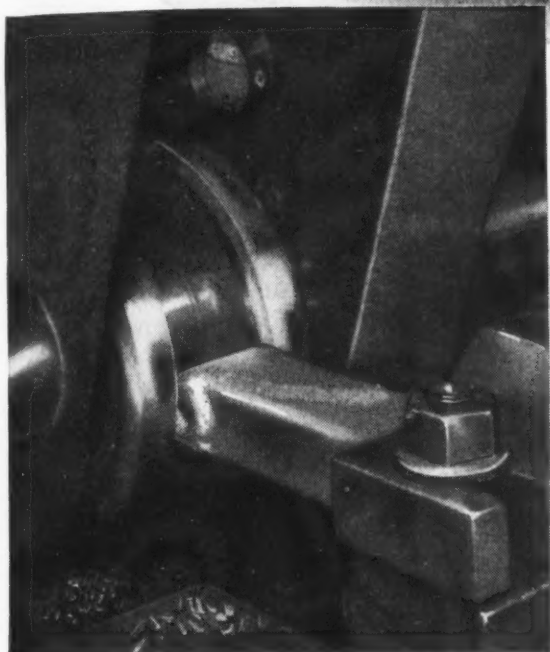
"The big point to remember, however, is the fact that resistance welding is not something to be thought of at the last minute, just as products are about ready to be put into production. Actually, resistance welding scores its biggest economic and manufacturing advantages when the product itself is designed for welding. Welding can, of course, be adapted to many present designs successfully—and often has been. On the other hand, design engineers who think in terms of resistance welding while designing their products may be surprised at the far greater efficiency that may be achieved."

Requests for information on resistance welding problems may be addressed to the Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia 6, Pa.



Bending a 15-inch beam in one of six sizes of bending and straightening machines brought out by the Thomas Machine Mfg. Co., Butler Road, Pittsburgh 23, Pa. This new line of machines, having capacities from 50 to 400 tons, has been developed for cold-bending beams, channels, forgings, etc., by means of a continuously running ram with one bending block which strikes the work to be bent midway between two bearing blocks, the length of the ram stroke being controlled by a large hand-wheel. The machines in this line range in weight from 3800 to 55,000 pounds, and have capacities for bending and straightening 5- to 24-inch beams

# KEEP 'EM FLYING with KENNAMETAL-TIPPED *Milling Cutters*



America's astounding record in airplane production will go down in history as one of the vital factors in winning World War II. Behind the scenes of this achievement are major advancements in technic of metal-cutting—among the most important of which is Kennamilling, the process of using Kennametal-tipped cutters to mill any kind of metal, including the toughest steels, at almost incredible speed.

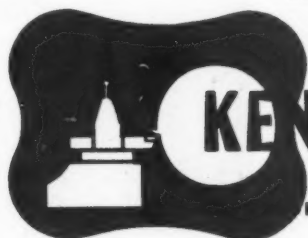
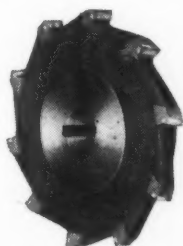
Kennamilling has contributed tremendously to the war effort, and will have a significant bearing on post-war production. Consider, for example, the savings effected in the following three instances:

- (1) Milling  $\frac{1}{2}$ " slots 9 inches long in alloy steel parts required 75 minutes with H.S.S. cutters. Kennamilling does the job in 70 seconds!

- (2) Face milling aluminum castings with H.S.S. cutters resulted in 10 finished surfaces per hour. Kennamilling turns out 125 per hour, and the quality of the work is much improved!

- (3) A multiple-pass milling job on heat treated steel billets was done with Kennametal-tipped cutters in  $\frac{1}{12}$ th the time required with H.S.S. cutters!

Switch to Kennamilling now—speed present war work—be equipped and gain the "know-how" for economical production in a future competitive commercial market. Ask a Kennametal field engineer to tell you about the revolutionary advancement in milling practices with Kennametal-tipped cutters. Write for catalog information.



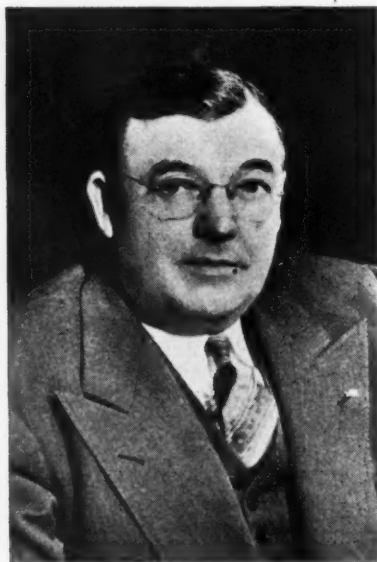
## KENNAMETAL

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## Twenty-Fifth Anniversary of the Ex-Cell-O Corporation

On July 10 the Ex-Cell-O Corporation, Detroit, Mich. celebrated its twenty-fifth anniversary. The story of the development of this concern is a typical saga of American business. Starting as a general tool shop on the second floor of a small two-story building having some 2000 square feet of floor space, the concern has grown until it now occupies several large plants totaling nearly a million square feet of floor space and provides jobs for more than ten thousand employees.



Phil Huber, President of the Ex-Cell-O Corporation

The first activities of the Ex-Cell-O Corporation consisted in producing jigs, fixtures, dies, drill jig bushings, and occasionally short runs of automotive parts. The keynote of the concern was "precision on a production basis." Precision jig bushings were one of the principal products of the firm in the early days, and the company played an important part in establishing drill jig bushing standardization throughout the metal-working industry.

As a result of research carried on with a view to improving its products, the concern developed various important machines and equipment. Other companies and their products were incorporated into the organization until today the Ex-Cell-O Corporation consists of several divisions, and includes among its products special high-speed automotive precision machines for boring, drilling, thread-grinding, lapping, and broaching, as well as cutting tools, grinding spindles, drill jig bushings, precision ball bearings, tool grinders, precision aircraft parts, and other equipment.

The president and general manager of the concern, Phil Huber, was one of the founders of the organization, and has been a member of the board of directors from the beginning. An anniversary booklet entitled "The First 25 Years" is being distributed by the company.

## Safety Standards for Welding and Cutting

A new American War Standard to provide safety in electric and gas welding and cutting operations has been approved by the American Standards Association. This standard was developed to protect workers from injury and impairment of health, and to safeguard property from fire and other damage arising out of installation, operation, and maintenance of electric and gas welding and cutting equipment. Copies of the Standard (Z49.1-1944) are obtainable at 40 cents each from the American Standards Association, 29 W. 39th St., New York 18, N. Y. Reduced prices are quoted on quantities of twenty-five or more.

\* \* \*

## Carbide Dies of Large Dimensions

An example of the expanding use of carbides for large drawing dies is the recent production at the Detroit factory of the Carboloy Company of a huge sheet-metal drawing die which weighs over 100 pounds. This die contains enough Carboloy cemented carbide to make several thousand average-sized tips for cutting tools. The hard carbide die rib is a shrink fit in a steel casing. It has an inside diameter of approximately 9 1/2 inches and an outside diameter of 13 inches.

Protection for the eyes of women chippers against flying objects is furnished by the new light-weight safety goggle here illustrated, which was brought out recently by the American Optical Co., Southbridge, Mass. The clear flat Super Armor-plate lenses set in small-sized eye-cups have an insulated ball chain bridge, designed for quick adjustment to suit the distance between the wearer's eyes





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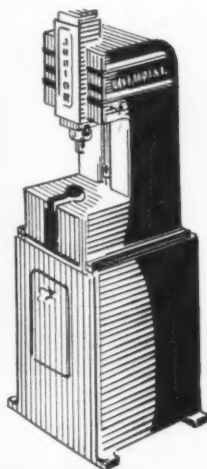
For light duty broaching or for assembling where pressures up to 4 tons are required, or for light duty straightening, etc., there is no better press than Colonial's new all hydraulic line of "JUNIORS".

Available either in bench or pedestal types and for either push or pull broaching (with special attachment). Capacities from one to four tons. Machined and counterbored platen for easy installation and location of fixtures. Plenty of daylight and clearance. Compact, powerful and sturdy. Remarkably low in cost when you consider the tremendous variety of jobs these presses can do.

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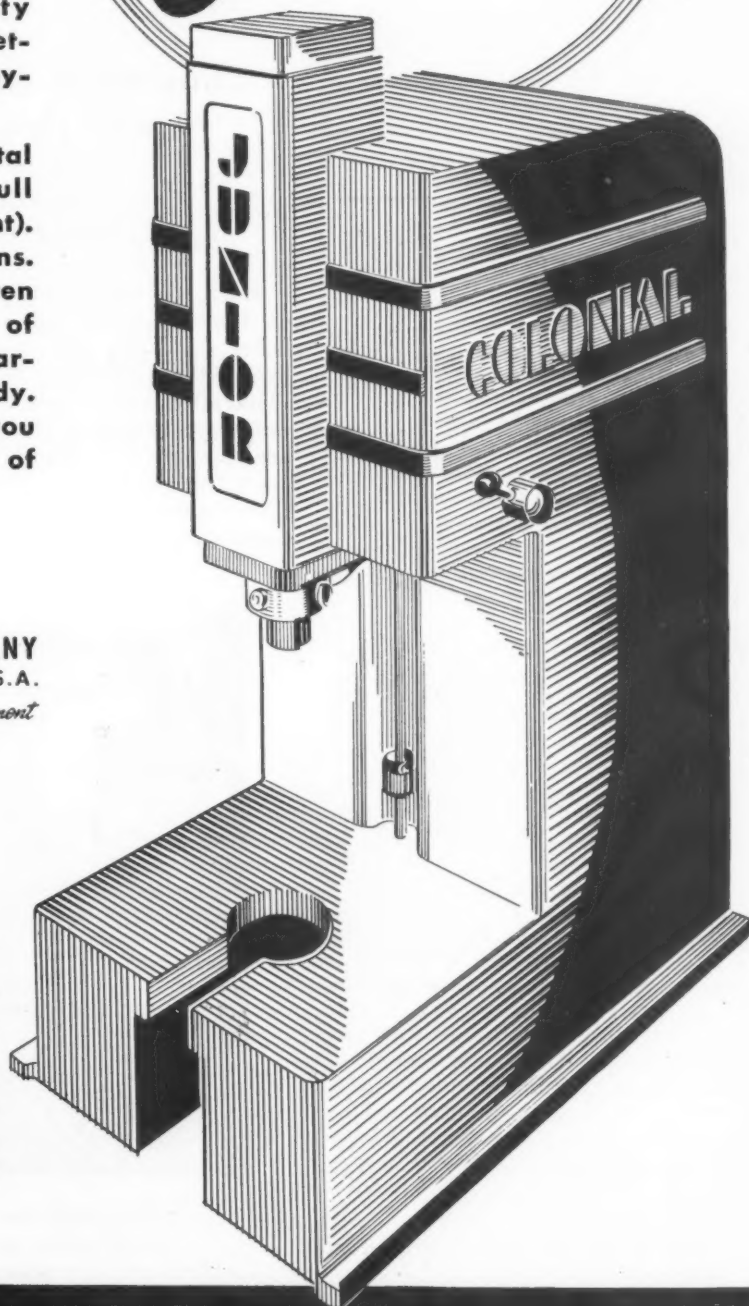
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## Bullet Profile Problem

By HENRY R. BOWMAN

The following problem arose recently in connection with the design of a new type of rifle bullet. Referring to the accompanying diagram, the radius  $R$  of the bullet, the length of nose  $A$ , and the radius of

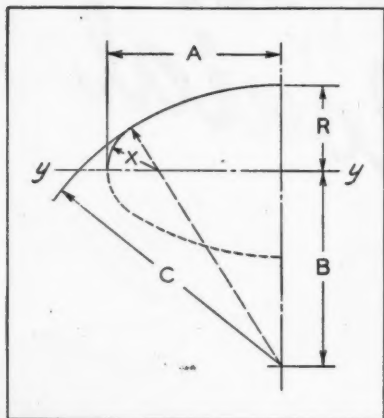


Diagram Illustrating Solution of Bullet Profile Problem

curvature  $C$  of the side of the nose were given. The problem was to determine the radius of curvature  $X$  of the end of the nose.

Let the length  $C-R$  be denoted as  $B$ . When  $C$  is drawn through the point where  $X$  intersects axis  $y-y$ , a right triangle is formed having sides  $A-X$  and  $B$  and hypotenuse  $C-X$ . Squaring both sides and the hypotenuse:

$$(A - X)^2 + B^2 = (C - X)^2$$

$$A^2 - 2AX + X^2 + B^2 = C^2 - 2CX + X^2$$

$$2CX - 2AX = C^2 - A^2 - B^2$$

$$X = \frac{C^2 - A^2 - B^2}{2C - 2A}$$

\* \* \*

### Negative-Rake Milling Reprints Available

Those interested in negative-rake milling can obtain reprints of the article on this subject published in March MACHINERY, at 25 cents per copy, by addressing The Industrial Press, 148 Lafayette St., New York 13, N. Y., attention Circulation Department. Enclose remittance with order if the amount is less than one dollar.

## Simple Method of Dividing Fractional Dimensions in Half

By H. MARSHALL ROEMER

The following arithmetical kink may prove of assistance to designers and draftsmen when dividing by 2, dimensions consisting of a whole number (especially an odd whole number) and a fraction. This work is sometimes found cumbersome. However, it can be accomplished rapidly by following the procedure here described.

Assume that the dimension to be divided is  $7 \frac{23}{32}$ . First divide the whole number by 2 and put down

the whole number of the quotient (in this case that number would be 3). Then add together the numerator and denominator of the fraction to be divided ( $23 + 32 = 55$ ). This is the numerator of the divided fraction. The denominator is equal to twice the denominator of the original fraction ( $2 \times 32 = 64$ ); hence, half the original dimension is  $3 \frac{55}{64}$ . The work can be done mentally in a fraction of the time that it takes to describe it.

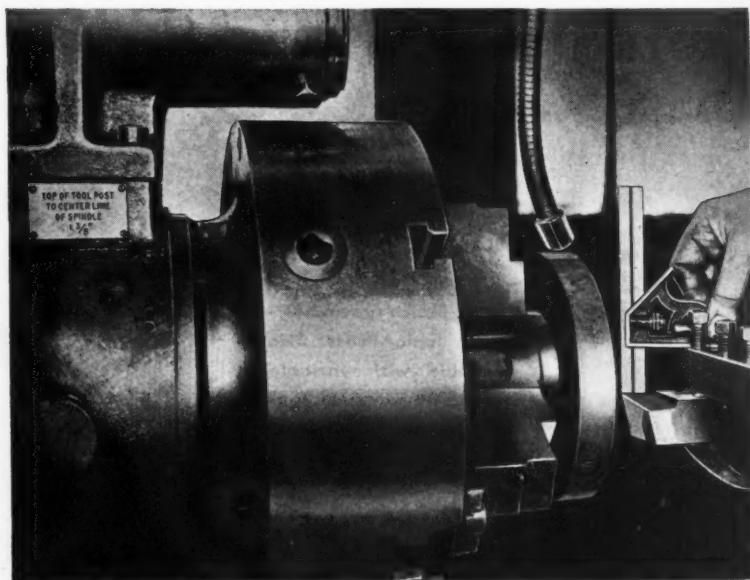
## Dimension Stamped on Plate Fastened to Lathe Head Simplifies Tool Setting

By PAUL ANDERSON, Group Leader  
Westinghouse Elevator Co., Jersey City, N. J.

Much has been said and written on the desirability of setting the point of a lathe tool on the center line of the work being turned. The illustration shows how this can be easily accomplished. The directions are stamped on a plate fastened to the lathe head. They merely state the distance from the top of the toolpost to the center line of the

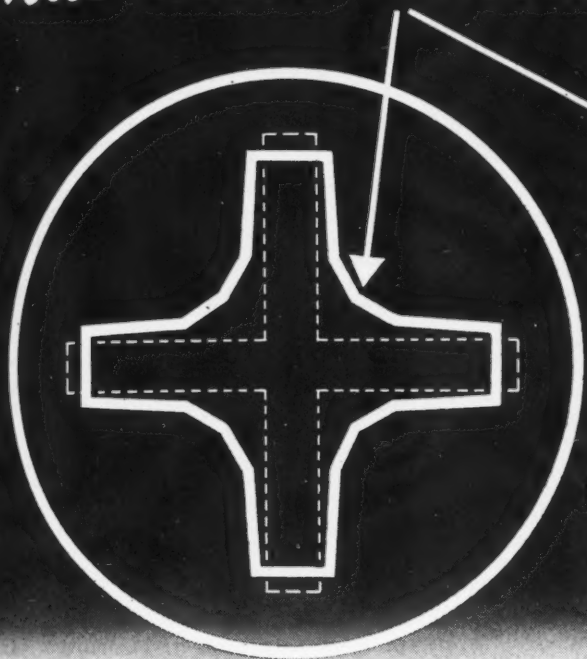
spindle. This is the distance the cutting tool point must be set below the top of the toolpost.

Tools properly set in the toolpost at the correct height relative to the center line of the spindle and work will have a longer life, give a better finish to the work, and make it possible to exercise closer control of the work dimensions.

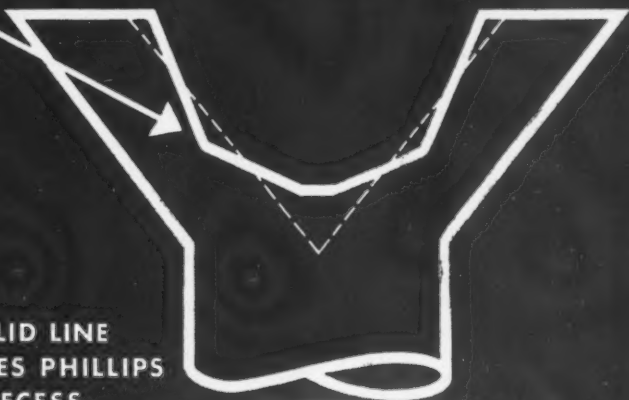


Setting Tool Point on Center Line of Work by Measuring  $1 \frac{3}{8}$  Inches from Top of Toolpost as Directed by the Stamped Plate on the Lathe Head

# ONLY ONE *Recessed Head Screw* has these 2 Trouble-Saving Features...



SOLID LINE  
DENOTES PHILLIPS  
RECESS



## It's PHILLIPS...the Engineered Recess

The left-hand drawing shows how scientifically the center corners of the Phillips Recess are *engineered*. Instead of being squared, these corners are *rounded* in a series of flat planes, with every angle and every dimension making a definite contribution to driving efficiency.

*This makes it possible for workers to utilize full turning power—without danger of burring or reaming out the heads of Phillips Screws.*

Now examine the right-hand drawing. This shows *more* scientific engineering. Instead of being tapered to a sharp point that would weaken the screw shank, the Phillips Recess has a nearly flat bottom.

*This makes it possible to set screws up uniformly tight without fear of screw heads shearing off. The flat bottom also permitted design of a stronger, longer-lasting driver point.*

Only the *Phillips Recess* is engineered this way. Only when you specify screws with the Phillips Recessed Head can you get the freedom from trouble . . . the strength and driving speed these features make possible. You can get Phillips Recessed Head Screws in any head style, type, or size.

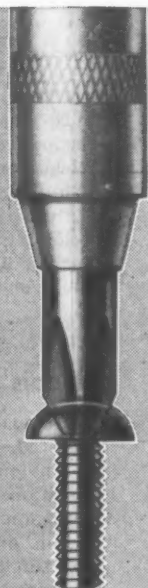


### TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS-- USE PHILLIPS SCREWS AND DRIVERS

**Faster Starting:** Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for inexperienced hands.

**Faster Driving:** Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

**Easier Driving:** Able to utilize their full turning power, workers can maintain speed without tiring.



## PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF TAPPING SCREWS · STOVE BOLTS

23  
SOURCES

American Screw Co., Providence, R. I.  
The Bristol Co., Waterbury, Conn.  
Central Screw Co., Chicago, Ill.  
Chandler Products Corp., Cleveland, Ohio  
Continental Screw Co., New Bedford, Mass.  
The Corbin Screw Corp., New Britain, Conn.  
General Screw Mfg. Co., Chicago, Ill.  
The H. M. Harper Co., Chicago, Ill.

International Screw Co., Detroit, Mich.  
The Lamson & Sessions Co., Cleveland, Ohio  
Manufacturers Screw Products, Chicago, Ill.  
Milford Rivet and Machine Co., Milford, Conn.  
The National Screw & Mfg. Co., Cleveland, Ohio  
New England Screw Co., Keene, N. H.  
Parker-Kalon Corp., New York, N. Y.  
Pawtucket Screw Co., Pawtucket, R. I.

Phell Manufacturing Co., Chicago, Ill.  
Reading Screw Co., Norristown, Pa.  
Russell Burdick & Ward Bolt & Nut Co., Port Chester, N. Y.  
Sevill Manufacturing Co., Waterville, Conn.  
Shakeproof Inc., Chicago, Ill.  
The Southington Hardware Mfg. Co., Southington, Conn.  
Wolverine Bolt Co., Detroit, Mich.



# News of the Industry

## California and Colorado

ROY H. JONES has been appointed direct representative in the Los Angeles territory for the line of hobs, milling cutters, and reamers made by the BARBER-COLMAN Co., Rockford, Ill. Sales and service office has been established at 832 W. 5th St. Mr. Jones has been with the Barber-Colman Co. for over twenty-seven years. He joined the company after completing a four years' engineering course at Lewis Institute in Chicago.

E. J. BUTLER, formerly sales manager of the Stock Division of the Bunting Brass & Bronze Co., Toledo, Ohio, has opened an office at 277 Seventh St., San Francisco, Calif., where he will act as a manufacturer's representative for the Pacific states. He has taken over the sales and distribution in that area for a limited number of leading manufacturers serving the industrial and automotive fields.

GEORGE W. GILLILAND has been appointed manager of the Los Angeles district sales office, 816 W. 5th St., Los Angeles 13, Calif., of Joseph T. Ryerson & Son, Inc. Mr. Gilliland became associated with the Ryerson organization in 1934, and has spent practically his entire business life in the steel industry.

AMPCO METAL, INC., Milwaukee 4, Wis., has built and completely equipped a new plant at 30 E. Burbank Blvd., Burbank, Calif. The West Coast activities of the company will henceforth be concentrated at the Burbank Works. E. H. WILSON is works manager, and P. P. BERGMANN plant superintendent.

NORTON Co., Worcester, Mass., has organized a new sales territory—the West Central Rocky Mountain District—under the supervision of RALPH O. ANDERSON as district manager, with headquarters in Denver, Colo. Mr. Anderson has been with the Norton Co. for over thirty years.

## Illinois and Indiana

HAROLD T. YOUNGREN has been appointed director of engineering development of the Borg-Warner Corporation, Chicago, Ill. He has been chief engineer with the Oldsmobile Division of General Motors since 1933. One of his chief duties will be the supervision of the Borg-Warner research laboratories. He will make Chicago his headquarters.

COLONEL JOHN SLEZAK, president of the Turner Brass Works, Sycamore, Ill., on leave of absence since being called to active duty with the Army in January, 1942, has been appointed chief of the Chicago Ordnance District. He was previously deputy district chief.

SINKO TOOL & MFG. Co., 351 N. Crawford Ave., Chicago 24, Ill., announces that its corporate name has been changed to SANTAY CORPORATION. There is no change in the activities or management of the corporation.

DR. LILLIAN M. GILBRETH and the late DR. FRANK B. GILBRETH (posthumously) have been awarded the 1944 Henry Laurence Gantt Memorial Gold Medal in recognition of their pioneer work in management, their development of the principles and techniques of motion study, their application of those techniques in industry, agriculture, and the home, and their work in spreading that knowledge through courses of training and classes at universities. The award will be made at the annual meeting of the American Society of Mechanical Engineers during the first week in December.

## Michigan

ALVAN MACAULEY, chairman of the board of the Packard Motor Car Co., Detroit, Mich., has been elected president of the Automotive Council for War Production for the third consecutive year, and president of the Automobile Manufacturers Association for the seventeenth consecutive year.

GEORGE M. LANGE has joined the Fuel Injection Division of the Ex-Cell-O Corporation, Detroit, Mich. Mr. Lange has been in Washington, D. C., for the last two years serving as a consulting engineer in the office of the deputy vice-chairman for production of the War Production Board.

ROLLED THREAD DIE Co., Worcester, Mass., has appointed GEORGE F. GETSCHMAN district sales manager for the territory comprising Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, and northwestern Ohio, with headquarters in the Fisher Bldg., Detroit, Mich.

ALUMINUM ALLOYS CORPORATION is the new name of the RAY DAY PISTON CORPORATION. The new location is at 7447 St. Aubin St., Detroit 11, Mich.

## New England

FREDERICK W. MESINGER was elected a vice-president of the Norma-Hoffmann Bearings Corporation, Stamford, Conn., at a meeting of the board of directors in June. He succeeds H. J. RITTER, who recently resigned. Mr. Mesinger takes up his new duties after twenty-four years' connection with the firm's engineering staff. For the last sixteen years he has been district manager of the New York office. D. E. BATESOLE has also been made a vice-president of the corporation. He has been a member of the firm's engineering department for over twenty-five years, and has been chief engineer since 1937.

CLOVER MFG. Co., Norwalk, Conn., maker of coated abrasives and lapping and grinding compounds, and the DIRATS MFG. Co., Westfield, Mass., manufacturer of precision grinding wheels, announce an inter-company agreement whereby each company will handle the products of the other, in addition to its own.

EASTERN MACHINE SCREW CORPORATION, New Haven, Conn., has appointed F. F. BARBER MACHINERY Co. Canadian representative, with offices in Toronto, Windsor, and Montreal.

JOHN R. CARLSON, formerly Dayton branch manager of the Heald Machine Co., Worcester, Mass., has been appointed sales manager of the company. Mr. Carlson has been connected with the Heald organization for nineteen years, and has served in various branch offices.

J. EDWARD DONNELLAN, formerly connected with the American Society for Metals, Cleveland, Ohio, has joined the General Alloys Co., Boston, Mass., as vice-president in charge of sales.

## New York and New Jersey

TIMKEN ROLLER BEARING Co., STEEL AND TUBE DIVISION, Canton, Ohio, has appointed BRACE-MUELLER-HUNTLEY sales representatives for Timken electric furnace alloy steels, seamless alloy steel tubing, and stainless steels. The new representatives have warehouses in Buffalo, Syracuse, and Rochester, N. Y., and in Montreal and Toronto, Canada.

M. C. HORINE has returned to his position as sales promotion manager of Mack Trucks Inc., Empire State



**... Shaping a pattern for Victory**



**OFFICIAL U. S. NAVY PHOTO**

***The LAKE ERIE name plate appears on more than 80% of America's aircraft Hydraulic Presses and when the emphasis shifts from war to peacetime pursuits, Lake Erie Presses will set a rapid pace for the production of many post-war products.***

**LAKE ERIE ENGINEERING CORPORATION • BUFFALO 17, NEW YORK**

Bldg., New York City, following his resignation from the War Production Board. For the past year he has been research consultant to the director of the Automotive Division of the War Production Board, with offices in Washington.

ALEX D. BAILEY, vice-president of the Commonwealth Edison Co., Chicago, Ill., has been nominated for president of the American Society of Mechanical Engineers for the coming year. Among those nominated for vice-president is John E. Lovely, vice-president of the Jones & Lamson Machine Co., Springfield, Vt.

H. O. TEEPLE has joined the technical service group of the Development and Research Division of the International Nickel Co., Inc., New York City. He will specialize on corrosion problems. Mr. Teeple is a graduate of the University of Michigan, class of 1937.

AMERICAN LOCOMOTIVE CO., 30 Church St., New York City, announces the following appointments: PERRY T. EGBERT, vice-president in charge of Diesel locomotive sales; WILLIAM S. MORRIS, vice-president in charge of steam locomotive and divisional sales.

A. WINKLER PRINS has been appointed manager of the New York district sales territory of American Machine and Metals, Inc., East Moline, Ill. The New York offices are located in the Woolworth Bldg.

SAM TOUR & CO., INC., engineers, metallurgists, and consultants, announce that the office and laboratories of the concern are now located in their building at 44 Trinity Place, New York 6, N. Y.

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., Passaic, N. J., has received the National Advertising Agencies Network first award for its employe relations program, which covers company publicity and other promotional activities dealing with employe relations.

CHARLES A. KOCH, formerly production engineer at the Ford Willow Run bomber plant, is now sales engineer with the Pollak Mfg. Co., Arlington, N. J.

## Ohio

JOHN J. PROCHASKA, for several years Cleveland district manager for the Cleveland Automatic Machine Co., has been appointed general sales manager to succeed GEORGE A. COLLIER, who has resigned to devote his time to personal interests. V. J. HANNON, formerly chief of general accounting, has been promoted to the position



John J. Prochaska, General Sales Manager of the Cleveland Automatic Machine Co.

of Cleveland district manager. Mr. Prochaska started with the company nineteen years ago as a toolmaker, and has filled various supervisory positions in the production end of the business, serving for several years as general superintendent. Since entering the sales department, he has performed many special services, both for the company and for war production, in the development of high-speed production methods with automatic equipment.

SAMUEL J. KORNHAUSER has been elected president of the National Tool Co., Cleveland, Ohio, succeeding the late Arthur J. Brandt. Mr. Kornhauser has been executive vice-president of



Samuel J. Kornhauser, Newly Elected President of National Tool Co.

the company since 1941, and previously, for twenty-five years, he served as a member of the executive committee, general counsel, secretary, and a director of the company.

EDWARD J. P. FISHER has been appointed manager of sales for the Morrison Engineering Corporation, Cleveland, Ohio. Mr. Fisher was educated at the Worcester Polytechnic Institute and the School of Mines, Columbia University. Since 1921 he has been connected with several of the leading industrial corporations in the country. He was the first recipient of the Wire Association Annual Medal of Award in 1934.

MEC-RAD DIVISION OF THE BLACK INDUSTRIES, Cleveland, Ohio, has started construction on a new building adjacent to the present plant at 1400 E. 222nd St., Cleveland, Ohio. JOHN ALTMAYER is general manager of the Division.

CHARLES E. SORENSSEN, formerly executive vice-president of the Ford Motor Co., Detroit, Mich., has been elected president of Willys-Overland Motors, Inc., Toledo, Ohio.

F. T. TURNER has been promoted to the position of assistant sales manager of the Brush Division of the Osborn Mfg. Co., Cleveland, Ohio.

## Pennsylvania and West Virginia

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has recently awarded the company's highest honor for distinguished service to eight men in the East Pittsburgh Works who have played an important part in war production. The men receiving the Order of Merit were EARLING FRISCH, designer of propulsion equipment for the Navy; JAMES DEKIEP, engineer on naval work; PETER R. DRYLIE, veteran employment interviewer; WALTER S. RISSE, machine tool buyer; WALLACE D. BISH, purchasing agent for office equipment and supplies; EVERETT McCANDLESS, test engineer for power station apparatus; ENOCH H. TURNOCK, Jr., engineer on welding electrode development; and EDWARD I. REED, manufacturing engineer who developed a new method for grinding porcelain insulators.

J. R. KINDIG, of Atlanta, Ga., has been appointed representative in the states of North and South Carolina, Virginia, Georgia, Louisiana, Florida, Alabama, Mississippi, Tennessee, and Arkansas for the line of chain hoists and electric hoists made by the Reading Chain and Block Corporation, Reading, Pa. DUNN & BRYAN have been appointed agents for the New York



and New Jersey territory; the TRANSMISSION ENGINEERING Co. for southern California, New Mexico, Arizona, and southern Nevada; and the ALASKA JUNK Co., Portland, Ore., for the state of Oregon.

R. V. DAVIES, R. B. MCKEE, and DONOVAN WILMOT have been appointed assistant general sales managers for the Aluminum Co. of America, Pittsburgh, Pa. Mr. Davies will have charge of sales engineering and sales development activities. Mr. McKee will be in charge of district sales offices and all direct selling activities. Mr. Wilmot has been placed in charge of product manager activities and warehouse distribution. Each of the three men has had over twenty-five years of experience in the manufacture and sale of aluminum products.

H. H. FULLER has been elected vice-president in charge of West Coast steel activities of the Bethlehem Steel Co., Bethlehem, Pa., succeeding W. H. STEWART, who has retired from active duty but who will continue in an advisory and consulting capacity. Mr. Fuller has been with the Bethlehem Steel Co. about twenty-five years. In 1936, he became assistant manager of sales for the New York district, and two years later, he was appointed district sales manager.

ALLEN GAUGE & TOOL Co., 421 N. Braddock Ave. and 7557-59 Finance St., Pittsburgh 21, Pa., has recently expanded its organization and added new equipment. The officers are as follows: President, C. H. ALLEN, Sr.; manager, R. C. ALLEN; assistant manager, C. H. ALLEN, Jr.; and chief engineer and superintendent, M. J. PATRICK.

CHARLES A. POWEL, manager of headquarters engineering of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was elected president of the American Institute of Electrical Engineers for the year beginning August, 1944. Mr. Powel succeeds Dr. NEVIN E. FUNK, vice-president of the Philadelphia Electric Co.

S. E. HACKETT has joined the Porter Blairsville Co., Blairsville, Pa., a division of the H. K. Porter Co., Inc., Pittsburgh, Pa., as vice-president in charge of production. Mr. Hackett was formerly president of the Jones & Laughlin Steel Corporation, being associated with the corporation for twenty years until he retired in 1938.

STOVER LOCK NUT & MACHINERY CORPORATION, Easton, Pa., has appointed RONALD JAMES SWEENEY director of research. Mr. Sweeney graduated from Cornell in 1928 in mechanical engineering. For many years, he has been engaged in engineering research for the U. S. Navy.

ERGOLYTE MFG. Co., 3627 N. Lawrence St., Philadelphia, Pa., builder of alternating-current continuous arc-welding machines and welding equipment, has opened a new plant at 3231 N. Lee St., of that city, exclusively for doing contract welding.

SAMUEL D. LEMMON, research metallurgist for Lukens Steel Co., Coatesville, Pa., has been appointed assistant engineer of tests. Mr. Lemmon has been with the Lukens Steel Co. since 1939.

WYCKOFF DRAWN STEEL Co., Pittsburgh, Pa., announces that the corporate name has been changed to WYCKOFF STEEL Co. This change is in name only, and does not involve any change in organization, service, personnel, or objectives.

ARTHUR S. SHOFFSTALL, general manager of the Huntington, W. Va., Works of the International Nickel Co., Inc., 67 Wall St., New York City, has retired. HERMAN M. BROWN, assistant general manager, succeeds Mr. Shoffstall, and JOHN A. MARSH, general superintendent, will take Mr. Brown's place as assistant general manager. Mr. Shoffstall will continue in the capacity of consultant to the head office of the company.

OCTOBER 30-NOVEMBER 1—Twenty-seventh semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

NOVEMBER 2-3—Eighth annual NATIONAL TIME AND MOTION STUDY CLINIC at the Medinah Club, Chicago, Ill., under the auspices of the Industrial Management Society. Further information can be obtained from the vice-president of the Society, C. S. Becker, 205 W. Wacker Drive, Chicago 6, Ill.

NOVEMBER 15-19—THIRD NATIONAL CHEMICAL EXPOSITION in the Chicago Coliseum, Chicago, Ill. M. H. Arveson, chairman Exposition Committee, American Chemical Society, 330 S. Wells St., Chicago 6, Ill.

NOVEMBER 27-DECEMBER 1—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Hotel Pennsylvania, New York City. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 27-DECEMBER 2—SIXTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING in Madison Square Garden, New York City. For further information, apply to Charles F. Roth, president, International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

JANUARY 8-12, 1945—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

\* \* \*

## Improved Gravity-Feed Oiler

The sight gravity-feed oiler made by the Oil-Rite Corporation, 3490 S. 13th St., Milwaukee 7, Wis., for machine tools and other machine equipment is now provided with a heavy-walled unbreakable Lucite reservoir, which is as clear and transparent as glass and does not become dull or cloudy through age or exposure to the sun. For application in cases where the temperature exceeds 150 degrees F., glass reservoirs can be furnished.

\* \* \*

## Two or Three Idlers in Planetary Gear Trains

A reader asks whether two or three idlers ought to be used in planetary gear trains between the sun and ring gears. This question is submitted to MACHINERY's readers.

## Coming Events

SEPTEMBER 21-23—Annual meeting of the NATIONAL TOOL AND DIE MANUFACTURERS ASSOCIATION at the Hotel Statler, Buffalo, N. Y. M. W. Rowell, general manager, Southern Bldg., 15th and H Sts., Washington, D. C.

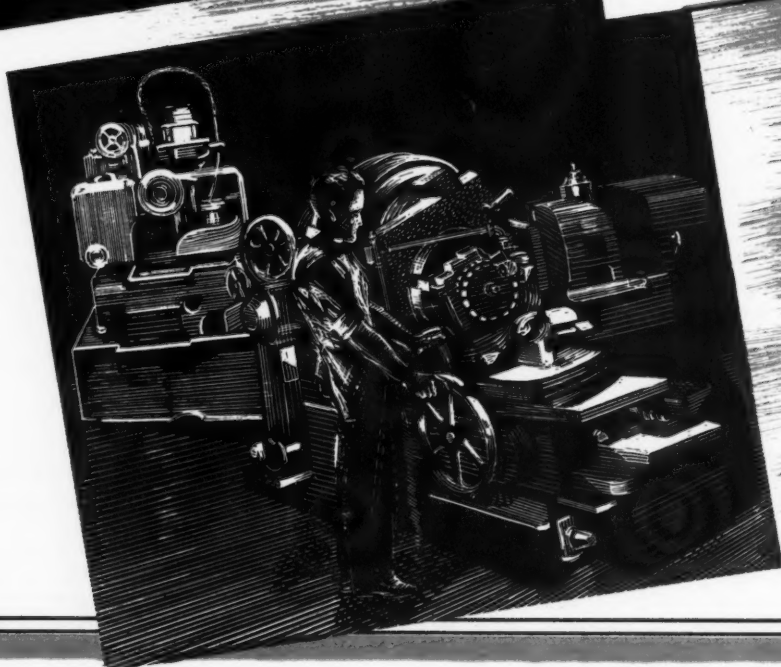
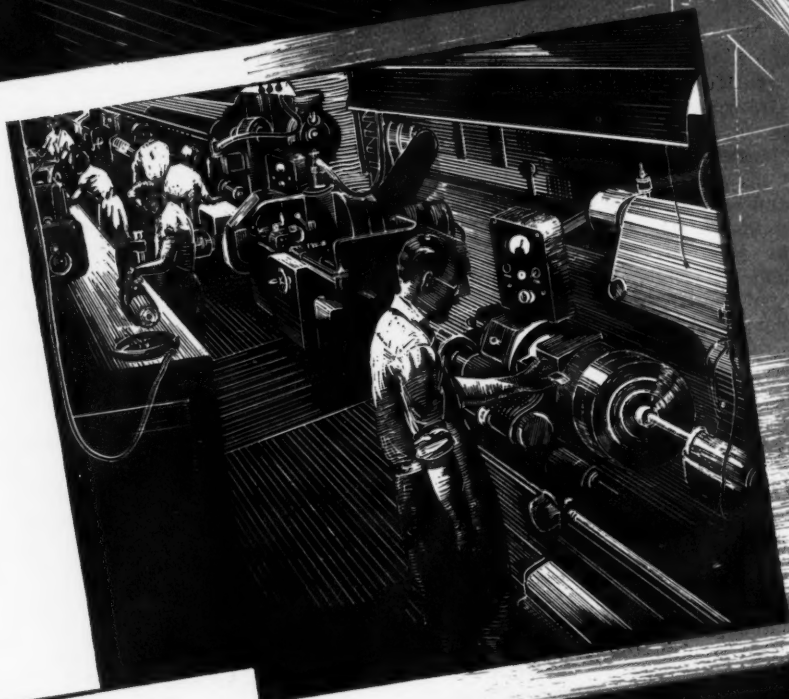
OCTOBER 2-5—Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Netherland-Plaza Hotel, Cincinnati, Ohio. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

OCTOBER 5-7—Aircraft Engineering and Production Meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Biltmore, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

OCTOBER 12-14—Semi-annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS at Syracuse, N. Y. Adrian L. Potter, executive secretary, 2567 W. Grand Blvd., Detroit 8, Mich.

OCTOBER 16-20—Twenty-sixth annual meeting of the AMERICAN SOCIETY FOR METALS and THE NATIONAL METAL CONGRESS, to be held at the Public Auditorium, Cleveland, Ohio. W. H. Eisenman, secretary, American Society for Metals, 7301 Euclid Ave., Cleveland.

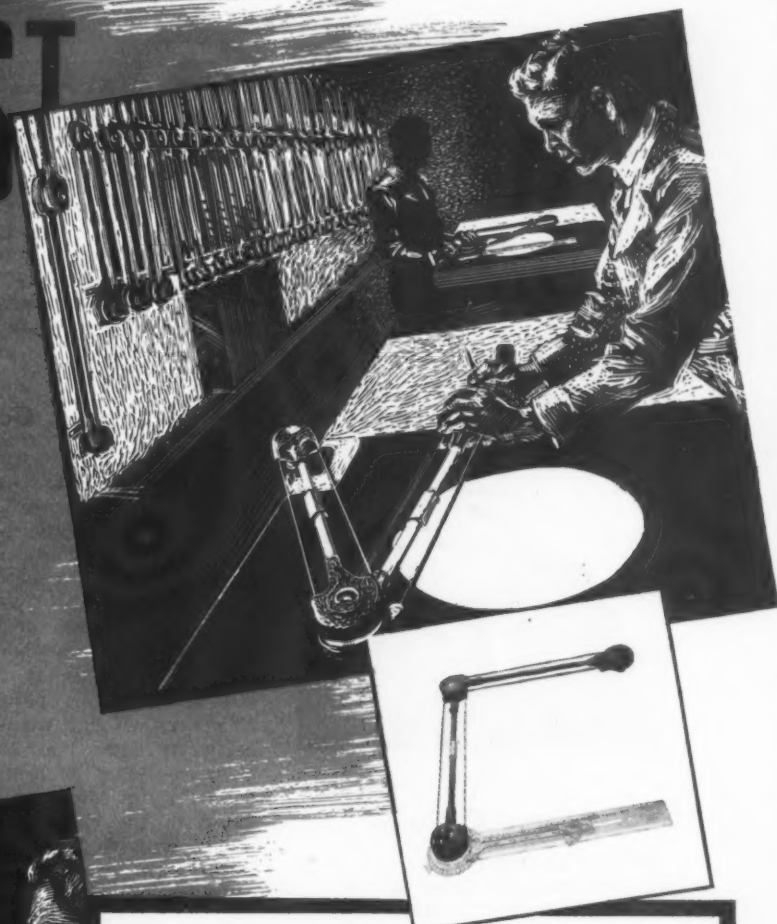
# WEST



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 Firearms & Ballistics • Technical Photography • Optical Engineering • Optical Grinding • Optical Machine Shop



# MEETS EAST

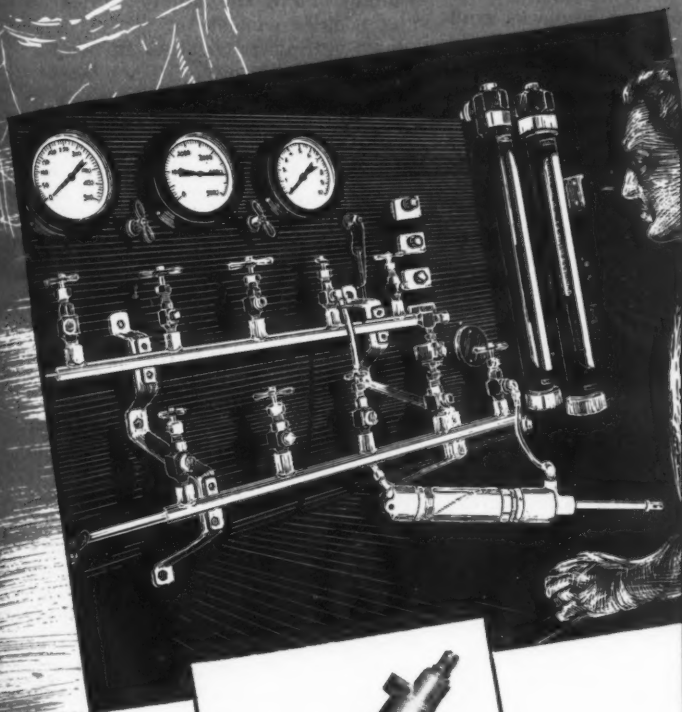


1,700,000 new Californians alone offer a whale of an increased market for that new product of yours. Perhaps you are searching for better methods of reaching this fast growing territory. Perhaps it would help to have your product finished right here on the Pacific Coast. VARD Inc. can help with your sub-assemblies or we can produce the complete work for you.

You might be surprised to know that in one plant we offer a foundry with heat-treating and testing departments, supported by a complete pattern shop. . . Extensive machine shops with highly trained machinists to turn out a variety of intricate hydraulic and other actuating devices, gears, clutches and navigation instruments. . . Inspection and assembly departments, with full hydraulic testing equipment to complement the manufacturing shops.

It might also be of great importance to you in the speeding of your production to know that our facilities include large optical and gage making departments. In temperature controlled rooms, we produce various types of thread, cylindrical and other gauges. Our skilled glass workers grind and polish lenses and prisms for gun sights, observation instruments and complete optical systems. To reduce reflections and increase light transmission, glass is Opticote treated. We engine-divide, engrave and calibrate protractors, dials, scales and calipers. We do our own painting, plating and anodizing.

VARD has the ability, equipment and plant to develop and produce not only fine precision products but also the capacity to produce them in required quantity. We invite your inquiry.



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| Stamping               | Hydraulics Testing Laboratory               | Milling & Grinding        | Shearing & Forming      | Turning & Shaping |
| Gear Cutting & Testing | Navigation Instruments — Assembly & Testing | Patterns & Wood Work      | Hydraulics Assembly     |                   |



## Obituaries



### George C. Purdy

George Carr Purdy, chairman of the board of Greenlee Bros. & Co., and dean of Rockford, Ill., industrial leaders, died on July 2 at the age of seventy-three years. Mr. Purdy was born in Middletown, N. Y., August 21, 1870, and was graduated with a Bachelor of Arts degree from Cornell University in 1892. The following year he returned to Cornell for work in marine engineering. He was a charter member of the Cornell chapter of Sigma Chi social fraternity. In 1893, he became associated with Greenlee Bros. & Co., then located in Chicago, and this was the beginning of a period of service with that organization which reached fifty years on August 10, 1943.

Shortly after joining Greenlee's, Mr. Purdy was made assistant sales manager, and in 1897, was appointed general manager in charge of all operations. In 1902 he was elected secretary-treasurer, and in 1904 moved the company to Rockford, Ill. In 1919, he was elected president, which position he held until 1943, when he became chairman of the board. As head of one of Rockford's major industries, which also is one of the leaders in the design and building of advanced machine tools, Mr. Purdy was well known in the industry. He had served as a director of the National Machine Tool Builders' Association and as president of the Association of Manufacturers of Woodworking Machinery.

Despite the close attention he gave to his business, Mr. Purdy always found time to devote to community service. One of his major interests was the Rockford Memorial Hospital, which he served as trustee for sixteen years, and as president of its board of

directors for six years. He was a member of the Second Congregational Church of Rockford and for many years served it in an official capacity. Mr. Purdy was also a member of the Rockford University Club, Rockford Country Club, Union League Club of Chicago, Rockford Rotary Club, and the American Society of Mechanical Engineers. He is survived by his wife, two daughters, and six grandchildren.

### Francis P. Gormely

Francis Patrick Gormely, president of Electro Metallurgical Co., Haynes Stellite Co., Michigan Northern Power Co., and several other units of Union Carbide and Carbon Corporation, New York City, died at his home in New Rochelle, N. Y., on July 13 after a short illness, at the age of fifty-six years.

Mr. Gormely was born in Wallaceburg, Ontario, Canada, in 1888. While still a child, his parents moved to Newberry, Mich., where he received his early education. In 1905, he entered the School of Engineering of the University of Michigan, and was graduated in the class of 1909 with the degree of Bachelor of Science in electrical engineering. That same summer he went to work for Union Carbide Co. at its Sault Ste. Marie, Mich., plant as an electrician, eventually becoming assistant superintendent.

In 1919, Mr. Gormely was transferred to the plant of Union Carbide Co. of Canada, Ltd., at Welland, Ontario, as superintendent. The next year he became superintendent of the Kokomo, Ind., plant of Haynes Stellite Co. In 1923, he was made assistant works manager for all the plants of the metallurgical group of companies of Union Carbide and Carbon Corporation, with headquarters in New York. In 1926, in addition to his other duties, he became general manager of Haynes Stellite Co., and in 1929, vice-president and general manager of all the companies of the metallurgical group. On May 22, 1944, he was elected president of these companies.

FRANK R. FROST, president of the Superior Steel Corporation, Carnegie, Pa., died on June 29 at the age of sixty-one, after an illness of several months. Mr. Frost was born in Meadville, Pa., in 1883. He graduated from Allegheny College in 1905 with the degree of Bachelor of Science. He became connected with the Superior Steel Corporation in 1917, and has been president since 1927.

DANIEL C. GREEN, chairman of the board and chief executive officer of the Cleveland Pneumatic Tool Co., Cleveland, Ohio, died on July 2 after an illness of seven weeks. He had served as chairman of the board since early in 1942.

## Machine Tool Catalogue in Spanish and Portuguese

A comprehensive catalogue of machines, machine tools, and cutting tools has recently been issued in both Spanish and Portuguese by a group of machine and tool manufacturing companies in the Detroit, Mich., area. The catalogue is laid out in sections devoted to the products of individual manufacturers. The companies represented are the Michigan Tool Co., Colonial Broach Co., Genesee Tool Co., Detroit Tap & Tool Co., Tungsten Carbide Tool Co., Colonial Bushings, Inc., and New Method Steel Stamps, Inc. Copies can be obtained by application to Denham & Co., 812 Book Bldg., Detroit 26, Mich.

\* \* \*

## How to Reduce Waste

A booklet that gives, in simple direct form, suggestions for reducing waste in manufacturing plants has been brought out by the Elliott Service Co. The booklet consists of two sections, one "Spotting the Causes of Waste," and the other "How to Attack Waste." The instructions are given chiefly in the form of check lists that suggest causes of waste and their remedies. The booklet is available from the Elliott Service Co., 219 E. 44th St., New York 17, N. Y., at 35 cents a copy, but is sold at reduced rates for ten copies or more.

\* \* \*

## Walrus Leather for Metal Finishing

Wartime conditions have made it difficult to obtain walrus hides and to prepare them properly for polishing metal surfaces. An improved process for preparing the hides for polishing purposes has, however, been developed, which makes it possible to offer such leather for polishing wheels or bobs. Greene, Tweed & Co., 4377 Bronx Blvd., New York 66, N. Y., announce that they are now in a position to furnish walrus leather prepared by this improved process.

\* \* \*

As much as 50 per cent reduction in the weight of electric equipment is possible by the use of the new Silicone insulating varnishes, according to R. C. Bergvall, of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These high-temperature insulations also make possible a substantial increase in the output of small motors, using the same frame. These Silicone resins fill the gap between organic and inorganic insulating materials.

# COMPLETE POWER UNIT

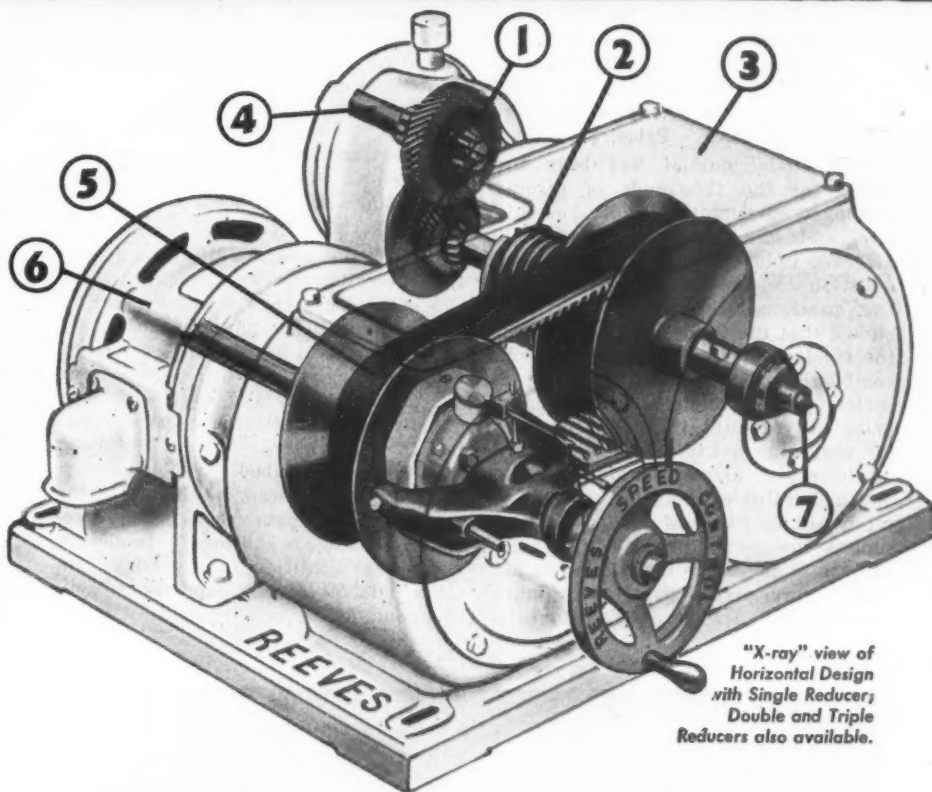
**1. HELICAL TYPE GEAR REDUCER** provides quiet transmission of gear load, better load distribution, longer life. Two or more angle-cut teeth in constant contact across gear face.

**2. TENSION SPRING** mounted on variable speed shaft, holds V-belt positively and automatically against disc faces. Makes it possible to secure maximum tension on belt at maximum speed, when maximum h.p. is required on unit and machine.

**3. ACCESSIBILITY TO OPERATING PARTS OF REEVES MOTODRIVE** is quick and easy. Simply remove four cap screws from cover plate. Removal and replacement of V-belt is readily accomplished.

**4. OUTPUT** variable speed shaft may be extended on either side of case—with or without reducer. A great convenience where wall, post or other obstacle might otherwise interfere; 13 different assemblies as to positions of motor, handwheel, shaft extension and reducer.

**5. V-BELT** is strong, endless cord construction, and held to minimum thickness to assure cool running and longer life. Very flexible, practically stretchless, of high tensile strength, evenly balanced in weight for proper load distribution. Transmits power smoothly and positively—without fluctuation or slippage.



"X-ray" view of Horizontal Design with Single Reducer; Double and Triple Reducers also available.

**6. ANY** standard foot-type, constant speed, ball-bearing motor may be used. Also several flange type motors.

**7. CONVENIENT LUBRICATION**—All operating parts lubricated through six force-feed fittings and 1 cup-type.

## REEVES Motodrive

**Motor Plus Variable Speed Plus Gear Reducer in one Compact, Enclosed Unit**

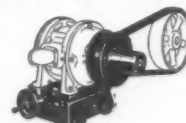
Output speeds from 1.35 to 3480 r.p.m. may be secured with the REEVES Motodrive through the many different combinations of sizes, speed ratios and reduction gears available. Thus this modern, totally enclosed, compact unit meets practically all requirements for variable speed within 15 h.p. capacities. Widely used on machines where space is limited or where direct connection between motor and machine is desirable. Takes any standard foot-type, constant speed motor. Like all REEVES units, the Motodrive is simple, rugged, accurate. Transmission of power is absolutely positive at all speeds. Handwheel or Electric Remote Control. Space-saving vertical and horizontal designs. Easily applied to any driven machine. Write for Catalog M-441, giving full information.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

### The Two Other Basic Reeves Units



**VARIABLE SPEED TRANSMISSION** for providing infinite speed regulation over wide range—2:1 to 16:1. Sizes fractional to 87 h.p.



**VARI-SPEED MOTOR PULLEY** converts any constant speed motor to a variable speed drive within 4:1 ratio. Sizes to 15 h.p.

# REEVES *Accurate Variable* Speed Control

## New Books and Publications

**AIRPLANE ENGINE MECHANICS—QUESTIONS AND ANSWERS.** By Rolla Hubbard and Augustin Dilworth. 260 pages, 4 3/4 by 7 1/2 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, \$3.

This little manual has been prepared for the thousands of aircraft employes, mechanics, pilots, machinists, and others connected with the aircraft industry. It is arranged in question and answer form. In writing the questions, the authors have assumed that the reader is familiar with the fundamental principles of internal combustion engines and their accessories. The questions are designed principally to aid in the preparation for obtaining a Civil Aeronautics Administration airplane-engine license, and a detailed explanation of the procedure to be followed in applying for such a license is included. The book comprises up-to-date instruction in aircraft power-plant principles, maintenance, and procedure. Considerable

space is devoted to actual operation and maintenance. Each section of questions is preceded by a brief explanatory text covering the points to which the questions refer.

**CONTROL OF ELECTRIC MOTORS.** By P. B. Harwood. 479 pages, 5 1/2 by 8 1/2 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, \$5.

This is the second edition of a book that describes briefly the characteristics of various types of motors and explains how these characteristics are used for control purposes. The design, construction, and operation of a number of controllers and control devices are discussed, and methods of combining these devices to secure a desired result are described. Problems frequently encountered, such as motor acceleration, dynamic braking, and resistor design are discussed in detail. The present edition of the book contains added information about synchronous motor control and variable-

voltage control, which has been included to meet the demand for further data on these subjects. Many new tables giving the ratings of motors and controllers have also been included, and the text and illustrations have been revised to conform to the latest practice.

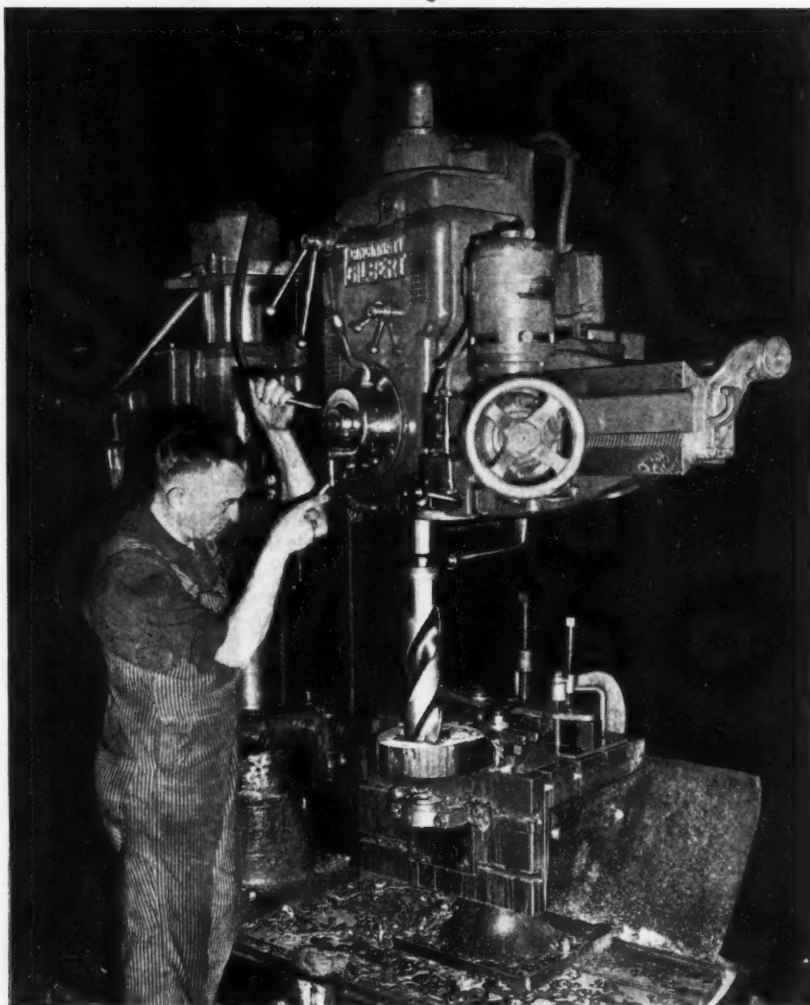
**WORK METHODS MANUAL.** By Ralph M. Barnes. 136 pages, 5 1/2 by 8 1/2 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$1.75.

This book has been written as a guide for supervisors, foremen, and workers on the principles of work organization and motion economy. It tells how to do a job with greater economy and efficiency and with less effort. The contents cover the following subjects: Developing a Better Method; The Job Breakdown; Process Charts—Flow Diagrams; Activity Charts—Man and Machine Charts; Operation Analysis—Right and Left-Hand Charts; Fundamental Hand Motions—Motion Analysis—Simo Charts; Ten Principles of Motion Economy; and Putting the New Method into Effect.

**WARTIME DATA SUPPLEMENT TO THE AMERICAN MACHINISTS' HANDBOOK.** By Fred H. Colvin and Frank A. Stanley. 154 pages, 4 by 6 3/4 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, \$1.

According to a statement in the preface, this supplement to the "American Machinists' Handbook" has been brought out to include many changes in materials and in shop practice brought about by the war effort in order to secure increased production in various lines of work. It covers materials; screw threads; drilling; cutting tools; grinding wheel markings; gearing; forging, forming, punching, and welding in aircraft work; inspection; and metal-cutting saws.

**PRINCIPLES OF HEAT-TREATING STEEL.** By Harold L. Walker. Published by the Engineering Experiment Station, Reprint Series No. 31, University of Illinois, Urbana, Ill. 45 pages, 6 by 9 inches. Price, 15 cents.



*Drilling a Hole 3 5/8 Inches in Diameter in a Steel Mast Link for a Liberty Ship on a Cincinnati Gilbert Radial Drilling Machine at the Oregon Shipbuilding Co.'s Plant. Holes are Drilled in Both Ends of the Links. The Links are 3 Inches Thick*



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## HOW TO INCREASE SHAPER CUTTER LIFE 300% PER SHARPENING

One of the simplest methods of increasing the life of shaper cutters is to protect the cutter against nicks like the one above. Normal amount of stock removal to sharpen a Michigan shaper cutter is only around 0.007 inches on the average. A nick like this one may mean the necessity of removing .025 to .030 inches of metal to resharpen the tool. The potential output of the tool for three additional sharpenings has thus been wasted.

While nicks in gear cutting tools may be caused by a variety of reasons, the most prevalent one is carelessness in handling. The very hardness which gives Michigan gear cutting tools their outstanding performance means that such tools require careful handling to prevent chipping, nicking or breakage. Extensive field investigation has revealed that in 4 out of 5 cases of damaged tools, the damage is due to incorrect or careless tool handling to and from machines, in the store-room, in sharpening (sharpening heat-checks which later result in tool failure), etc.

*Do you have a copy of "Shaping"? Ask for Bulletin GS-42.*



# MICHIGAN TOOL COMPANY

7171 E. MCNICHOLS ROAD . . DETROIT 12, U. S. A.



MACHINERY, August, 1944—239

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Your Progress Depends Upon Your Knowledge of Your Industry

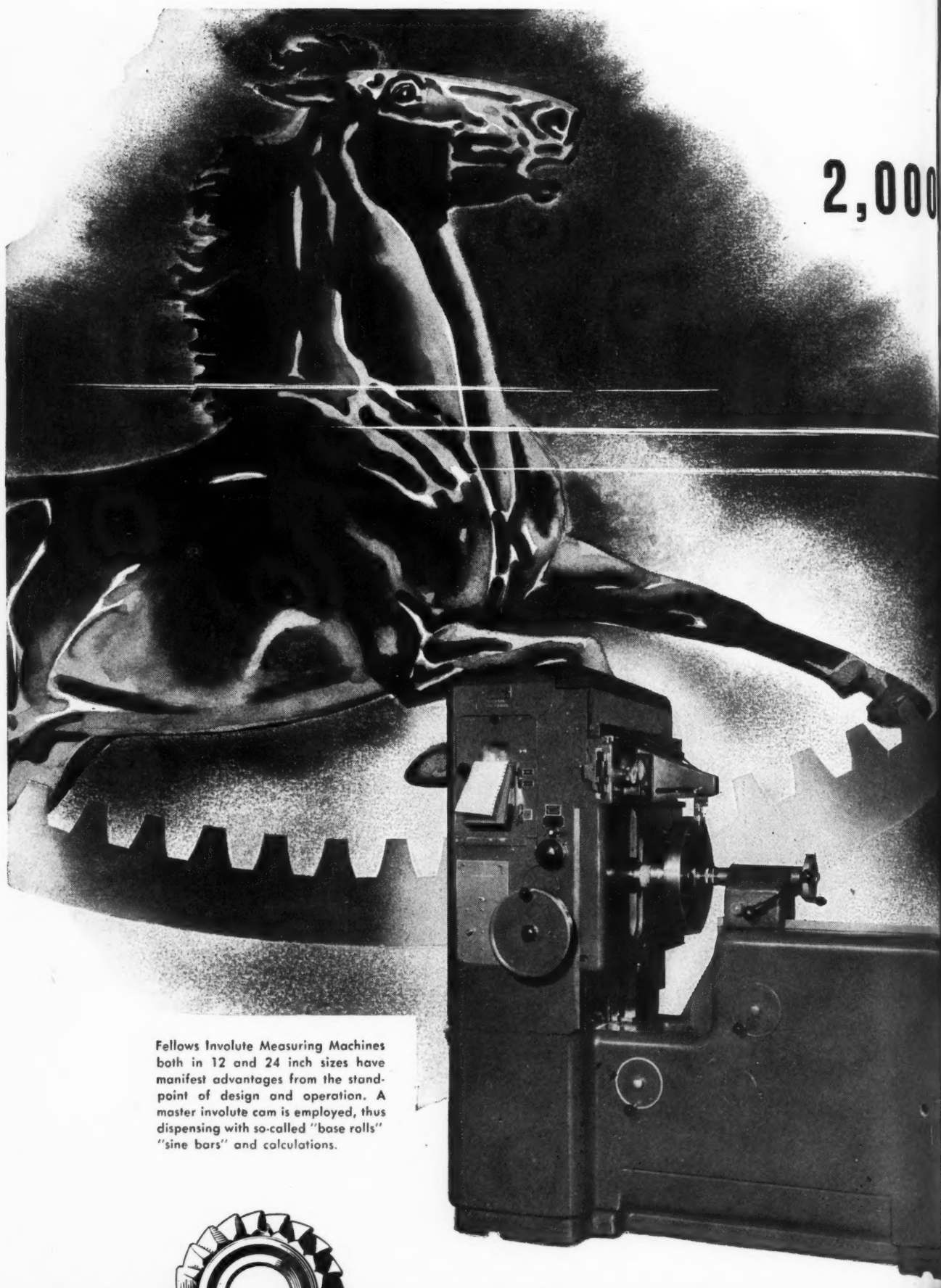


*U. S. Army Air Forces Photo*

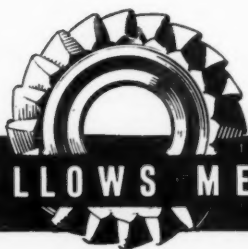


**WAYNESBORO  
Penna. U.S.A.**





Fellows Involute Measuring Machines both in 12 and 24 inch sizes have manifest advantages from the stand-point of design and operation. A master involute cam is employed, thus dispensing with so-called "base rolls" "sine bars" and calculations.



THE FELLOWS METHOD...MACHINES AND TOOLS FOR

# HORSEPOWER

## ON A SINGLE GEAR LIKE THIS



Gear tooth loading is now carried beyond man's imagination of a few years ago. This is a triumph of metallurgy, engineering, and precision-controlled manufacturing methods, and also a tribute to the cumulative development in machine tools and inspection equipment.

Fellows' reservoir of nearly 50 years of gear production knowledge has in no small measure contributed to this outstanding development, both in the production of cutting and finishing machines, and in the means for accurately checking the finished product.

Fellows Involute Measuring Machines in the 12 and 24-inch sizes have made possible the checking of gear tooth profiles to degrees of precision that heretofore have not been possible. These machines are also available with an electronic-operated charting mechanism which produces an accurate record of the profile for comparison and record. Above all, these machines are simple in construction and are easy to operate.

For details of the Fellows Involute Measuring Machines write for descriptive bulletin. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, or 640 West Town Office Bldg., Chicago 12.

# *Fellows*

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



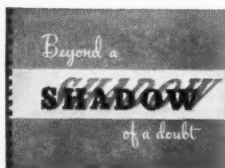
This Jones & Lamson Optical Comparator is being used to inspect the thread of a vital airplane part. Angles can be measured to within plus or minus 2 minutes of arc, and vertical and horizontal measurements can be made to .0001 of an inch.

MAKING

There are people who *must* make mountains out of molehills. They are those who must detect and measure the microscopic irregularities that would, if undiscovered, swell scrap heaps, retard production and even endanger lives.

Jones & Lamson Optical Comparators enlarge minute imperfections to conspicuous size. By the use of the Comparator, inspectors of tools and products can *see* and *measure*, accurately and quickly, faults that might elude other means of inspection.

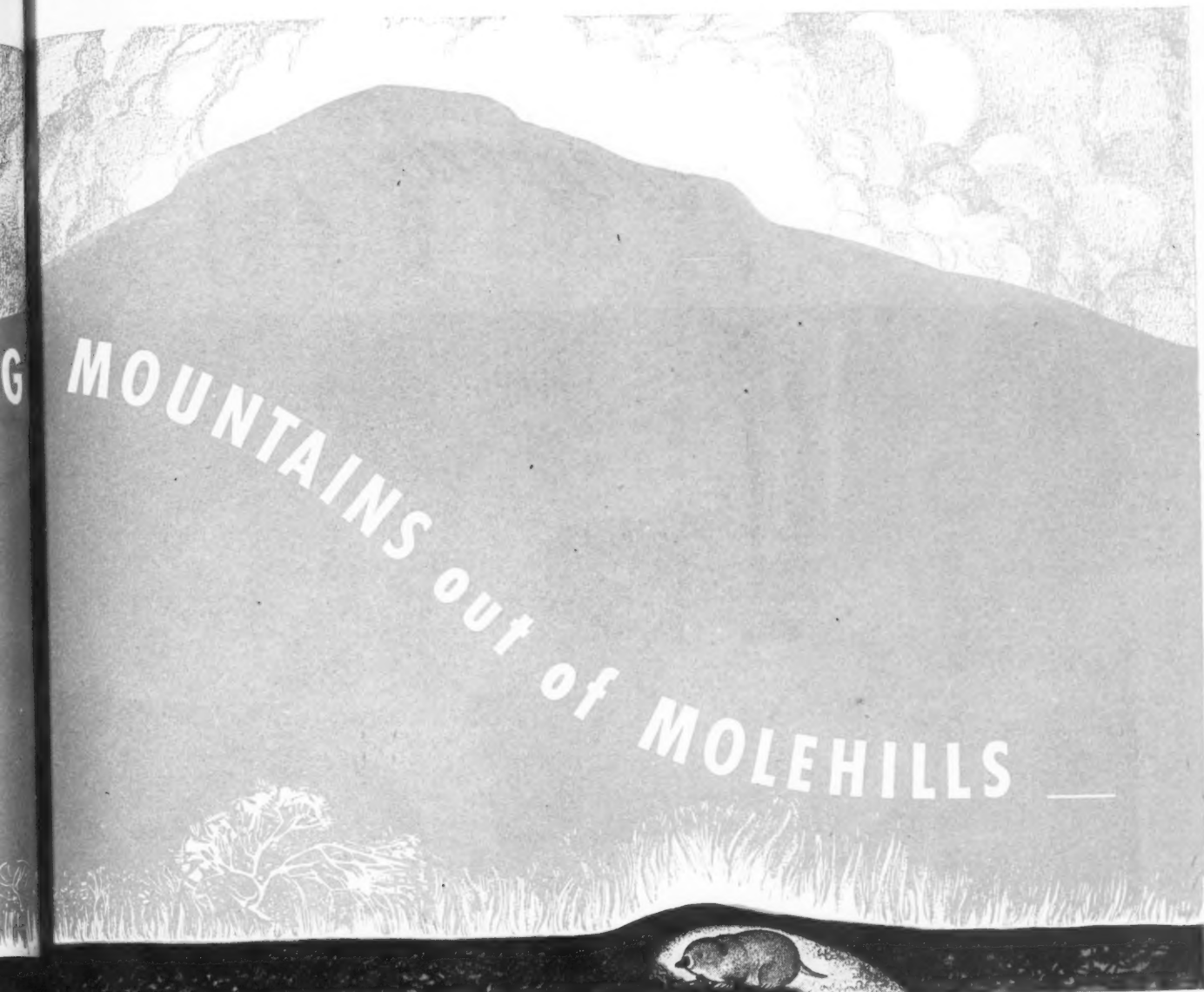
Jones & Lamson Optical Comparators are made in various models to meet every need. Ask Jones & Lamson inspection engineers how you can use them to expedite and improve inspection in your plant. Ask them today!



This book, "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

When purchasing equipment for measurement and inspection by optical projection, you should demand: **1.** Precision Condensing Lens System for controlling light. **2.** Projection lenses that project a sharply defined image, free from distortion and color, anywhere on the screen. **3.** Optically Flat Reflection Mirrors sufficiently thick to insure permanent flatness. **4.** Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other. **5.** Rigid Machine Construction.



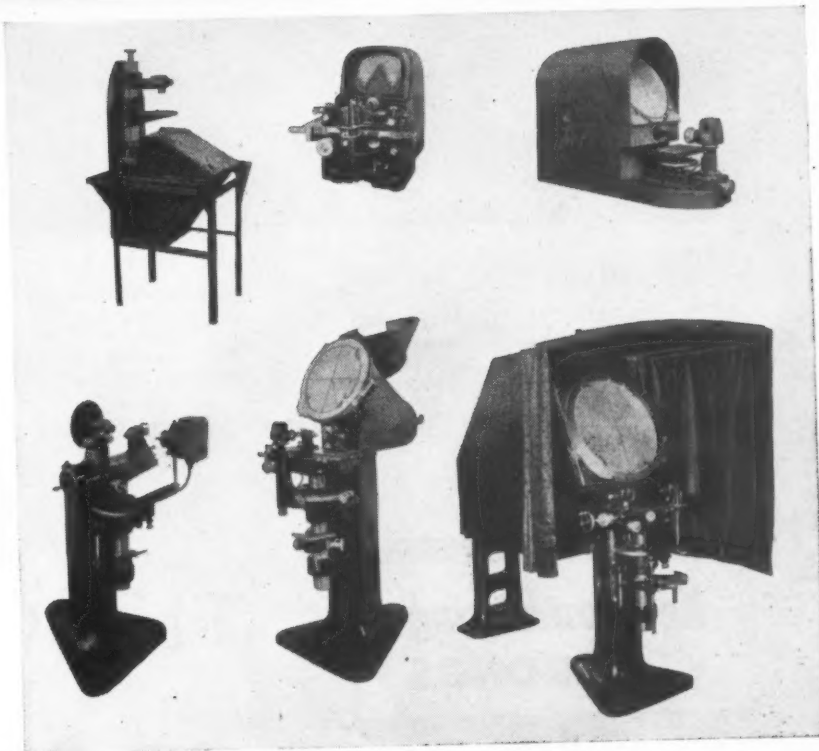


# **JONES & LAMSON**

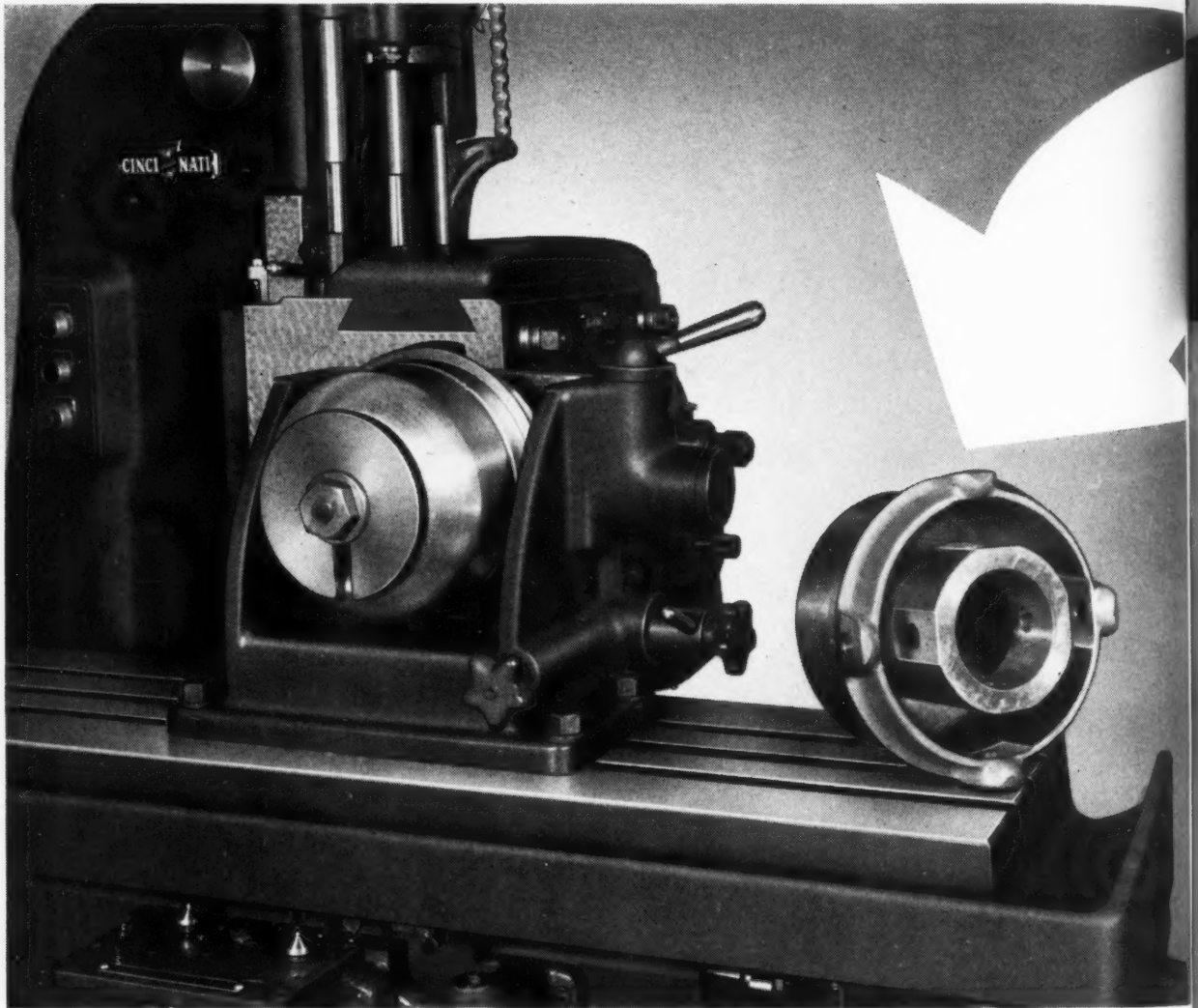
**MACHINE COMPANY**  
SPRINGFIELD, VERMONT, U. S. A.

## **OPTICAL COMPARATORS**

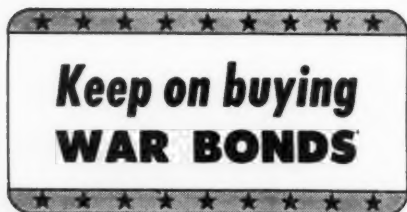
Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



# An inside job



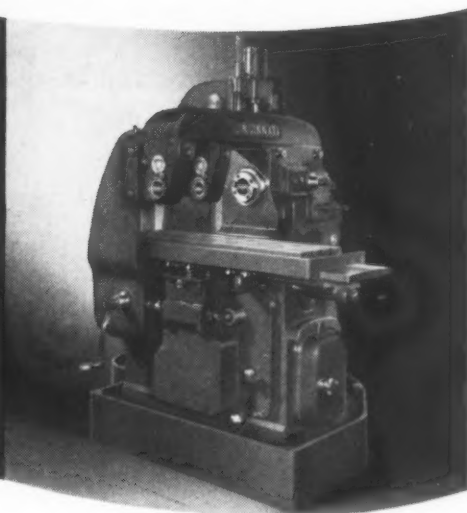
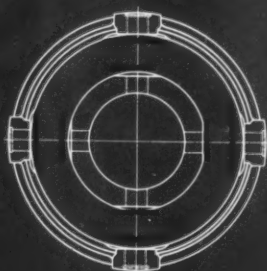
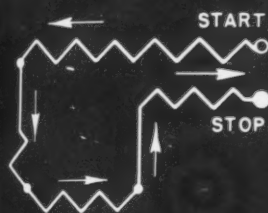
Arrow points to a close-up of the milled part. Notice the eight flats—four on the hub and four on the inside of the rim. The machine is a CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine. For complete specifications, write for catalog M-909-1. Sweet's Catalog File for Mechanical Industries gives a brief description.



## THE CINCINNATI M

MILLING MACHINES

# AUTOMATICALLY MILLING TWO OPPOSITE FLATS



*Above, left to right: Diagram of the automatic cycle for this job; drawing of the part (heavy lines indicate milled surfaces); standard CINCINNATI No. 2-24 Automatic Rise and Fall Miller on which work of this type can be handled.*

In the illustration at the left, a CINCINNATI No. 2-24 Automatic Rise and Fall Miller is milling two opposite flats in four positions on an aluminum piston for an aircraft propeller. Four of the flats are on the inside diameter of the rim, while the four opposing flats are on the outside diameter of the hub. Each pair of flats is automatically milled in one cycle. The flat on the hub is milled first. The spindle carrier rapid traverses down and feeds the cutter to depth on the rim, then follows the milling cut for the flat on the rim.

The spindle carrier rapidly returns to the top of the stroke and the table traverses slightly to the left so the cutter clears the hub. ¶ The fixture which holds the part is arranged with four-position hand indexing, with the index holes located in the work itself. The entire setup solved a very difficult milling operation within the narrow space between the hub and the rim of the part. ¶ Whatever your milling problems, irrespective of their complexity, it will be to your advantage to consult the engineers here at Milling Headquarters.

**CINCINNATI MILLING MACHINE CO.** CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES

CUTTER SHARPENING MACHINES

MACHINERY, August, 1944—9



CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; and 36", 48" and 72" between-center lengths. (12" size illustrated below)



# MODIFIED TOOLROOM

*Does special production*

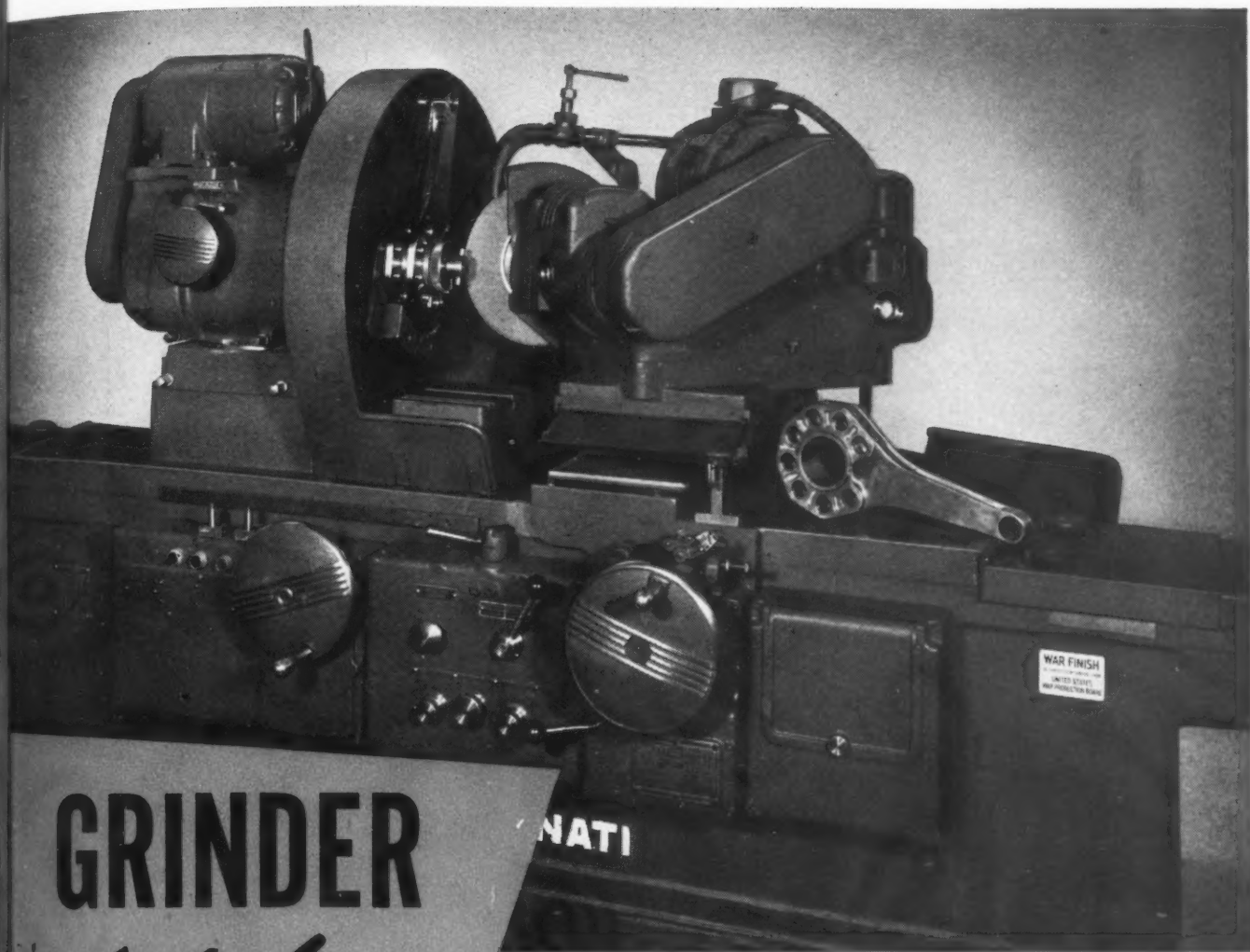
CINCINNATI Application Engineers have demonstrated many times that standard CINCINNATI machines, with some modification, will handle a big percentage of so-called special jobs. The case illustrated is a good example: Grinding the face and hub diameter of aircraft engine master rods. This type of job presents several requirements: a) large swing; b) grinding wheel set at an angle;

c) special truing; d) close tolerances of accuracy. These requirements were met with a CINCINNATI 18" x 36" Hydraulic Universal Grinding Machine and the following special equipment: Modified Headstock; Wheel Head Swivel Plate arranged to bridge table; Multi-purpose Sliding Table; Face Plate Fixture; and Table Retraction Controls (for loading purposes). This may

★ ★ ★ ★ ★ ★ ★ ★ ★ ★  
**Keep on buying  
WAR BONDS**  
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

## CINCINNATI

CENTER TYPE GRINDING MACHINES



# GRINDER

*job!*

*CINCINNATI 18" x 36" Hydraulic Universal Grinding Machine after it has been modified to handle a highly specialized job of grinding face and hub diameter of master rods.*

seem like a lot of special equipment, but actually the grinding of these master rods, a highly specialized job, is handled on a machine more than half of which is standard. ¶ It's possible you may have a grinding job that could be handled to better advantage on a slightly modified machine. Why not talk it over with the engineers here at Grinding Headquarters? They will be

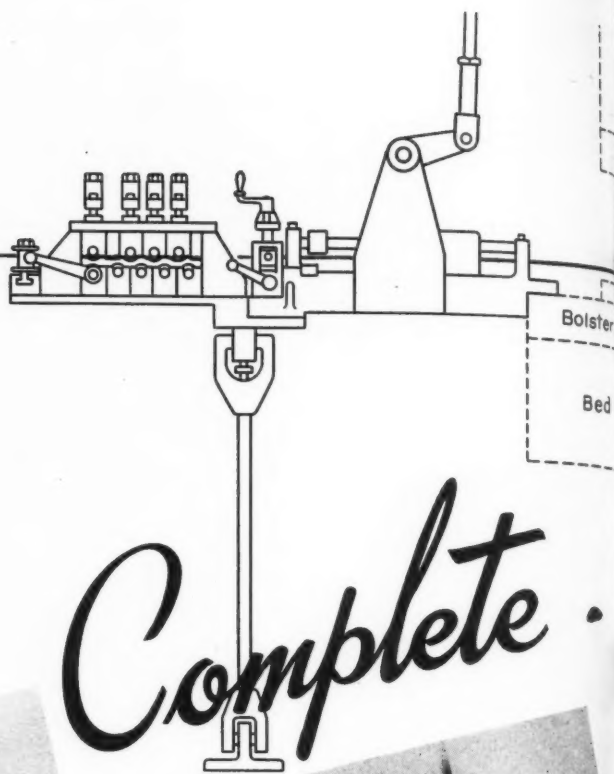
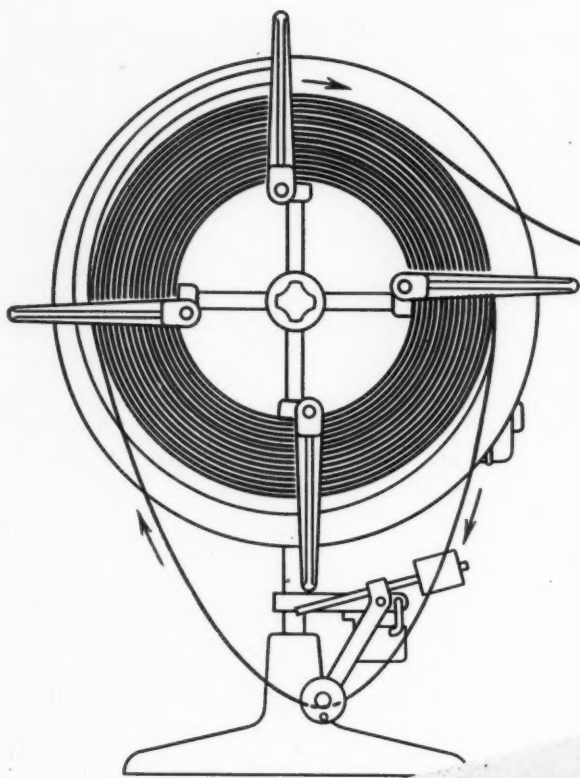
glad to give you the benefit of their wide experience in either centertype or centerless grinding operations. ¶ For complete details and specifications on CINCINNATI 12" Hydraulic Universal Grinding Machines, ask for catalog G-486-1. For the 14", 16" and 18" machines, ask for catalog G-474-1. Sweet's Catalog File for Mechanical Industries gives a brief description.

## GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

MACHINERY, August, 1944—11



*Complete.*



These photographs illustrate clearly the units depicted in the drawing above. At the left is the newly patented design for the U. S. Automatic Centralizing Stock Reel . . . note the spiral disc for positive accuracy in centralizing the coil. The insert illustrates, from left to right, the U. S. Slide Feed, Roller Check and Stock Straightener, properly set up on the bolster of a press. Full details in Bulletin No. 50.

U. S.

TOOL COMPANY, INC.,

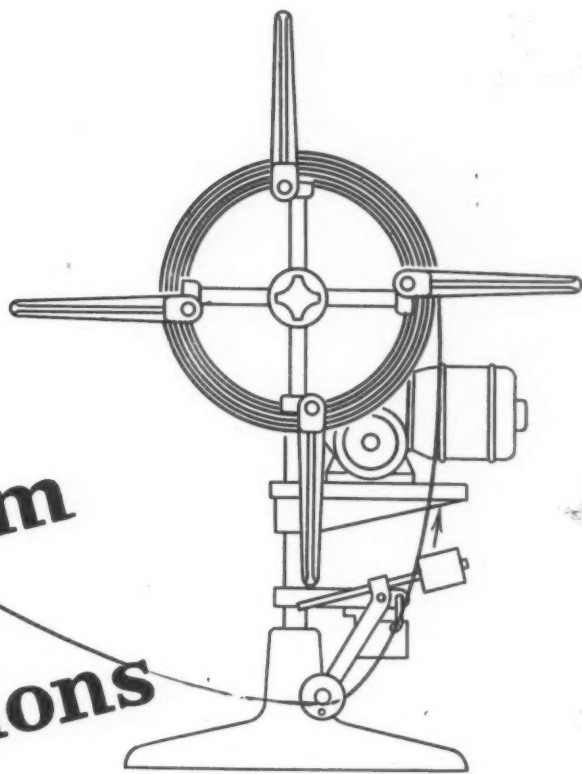


BUILDERS OF U. S. MULTI-SLIDES . . . U. S. MULTI-MILLERS



Die  
Plate  
of Press  
Bed

# automatic U.S. Press - room Equipment for improved operations



The above drawing illustrates the ideal set-up for metal stamping. It consists of the U. S. Automatic Stock Reels applied in conjunction with U. S. Slide Feed, Roller Check and Stock Straightener. This combination assures high speed, top efficiency and the greatest possible economy. The unit at the left of the drawing illustrates the patented design for the latest U. S. Stock Reel, which features a spiral grooved disc (visible in the accompanying photograph) for easily and accurately centralizing the stock.

The next unit to the right in the drawing is a combination of the U. S. Slide Feed, Roller Check and Stock Straightener, the perfect setup for accurately feeding coil stock into punch press dies without the need of pilots. The Slide Feeds are available in a range of sizes to accommodate various widths of stock and feed lengths. The feed-accuracy obtained surpasses by far the accuracy of roll feeds, hitch feeds or hand feeding. The photo insert illustrates clearly the No. SF-2 Slide Feed — capacity 6" wide x 8" feed length —

mounted as a unit with the Roller Check and a 7-roll Plain Stock Straightener. The Roller Check (mounted between the Feed and Straightener) consists of a pair of rolls controlled by a one-way clutch, permitting free forward rotation only and positively preventing backward slippage, regardless of tension. The Stock Straightener is fully dependable, with the advantage of anti-friction bearings, crank-operated entering rolls (to start a new coil without disturbing the setting), provision for adjusting each individual roll for the desired straightening action, and assurance of parallelism between all rolls.

Indicated at the extreme right is another U. S. Automatic Stock Reel for rewinding scrap; this is essentially the same as the Reel at the left, except that the Centralizing feature is omitted.

Detailed features of each of these U. S. units are fully illustrated and described in Bulletin No. 50 — with complete specifications for these units (also Coil Cradles and Stock Oilers). Write for your copy.

## AMPERE (East Orange), NEW JERSEY

U. S. AUTOMATIC PRESS ROOM EQUIPMENT . . . U. S. DIE SETS AND ACCESSORIES

**VERSATILE CUTTERHEAD..**  
**SAVES WORK RESET-UPS**  
**SIMPLIFIED CONTROL..**  
**PROVIDES EXTRA OPERATING CONVENIENCE**



**SPECIFICATIONS**

No. 22L UNIVERSAL MILLER. Table: 45" x 10". 9  
Speeds: 40 to 1100 r.p.m. 12 Feeds: 5" to 36". Cutter-  
head adjustable between vertical and horizontal: 90°

# ...on **VAN NORMAN** Universal Millers

The versatile cutterhead on Van Norman Ram Type Universal Millers gives you vertical, horizontal or angular milling by simply swinging the cutterhead to the desired milling position. Thus in one compact machine you have the range of several types of millers.

This Van Norman feature enables operators to complete most milling operations on a workpiece without re-setting the work. In addition, there is no waiting for other types of millers to become available. The valuable time saved

often increases the productive output of the machine and operator by as much as 50%. (note the typical milling applications shown below)

The adjustable cutterhead...combined with front and rear directional control of all power feeds for the table, knee, saddle, as well as 6-way rapid traverse... quick-change speed and feed selectors conveniently located for easy reach by the operator... and other important Van Norman Features which assure accuracy, economy and top production.

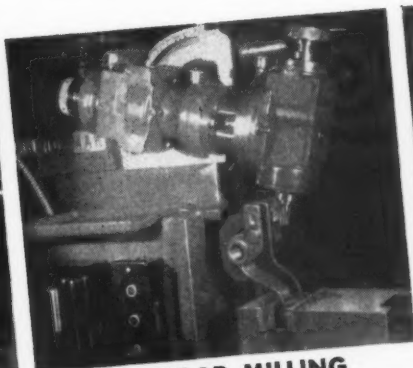
*"It pays to Van Normanize"*

**VAN NORMAN COMPANY**

SPRINGFIELD 7, MASSACHUSETTS



**HORIZONTAL MILLING**



**ANGULAR MILLING**



**VERTICAL MILLING**



**BORING**



**SLOTING**



**ANGULAR MILLING  
with sub head**



# "Put it on the Blanchard"



## ...GET THESE ADVANTAGES

- Production** ✓
- Adaptability** ✓
- Fixture Saving** ✓
- Operation Saving**
- Material Saving**
- Fine Finish**
- Flatness** ✓
- Close Limits**

## Grinding Aluminum Base Castings

These frail castings are ground on two sides flat and parallel on a No. 18 Blanchard Surface Grinder. They measure  $23\frac{1}{2}$ " x  $21\frac{1}{2}$ " x 11" and  $\frac{5}{32}$ " stock is removed from each side. One piece is ground at a time, lightly held by clamps to a steel base plate which is magnetically held on the chuck. Two pieces, four surfaces, are finished per hour.

If you have work, large or small, that requires flatness, squareness, parallelism and fine finish, "put it on the Blanchard" for best and fastest results.



Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



*The* **BLANCHARD MACHINE COMPANY**

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

.... another example of

*Consolidated*

HEAVY  
MACHINE TOOL

*Versatility*

## NEWTON MILL-N-SHAVER



COMBINATION UNIT HEAD MILLING  
AND SHAVING MACHINE WITH 2  
SINGLE VERTICAL MILLING HEADS  
AND 2 FINISH SHAVING HEADS

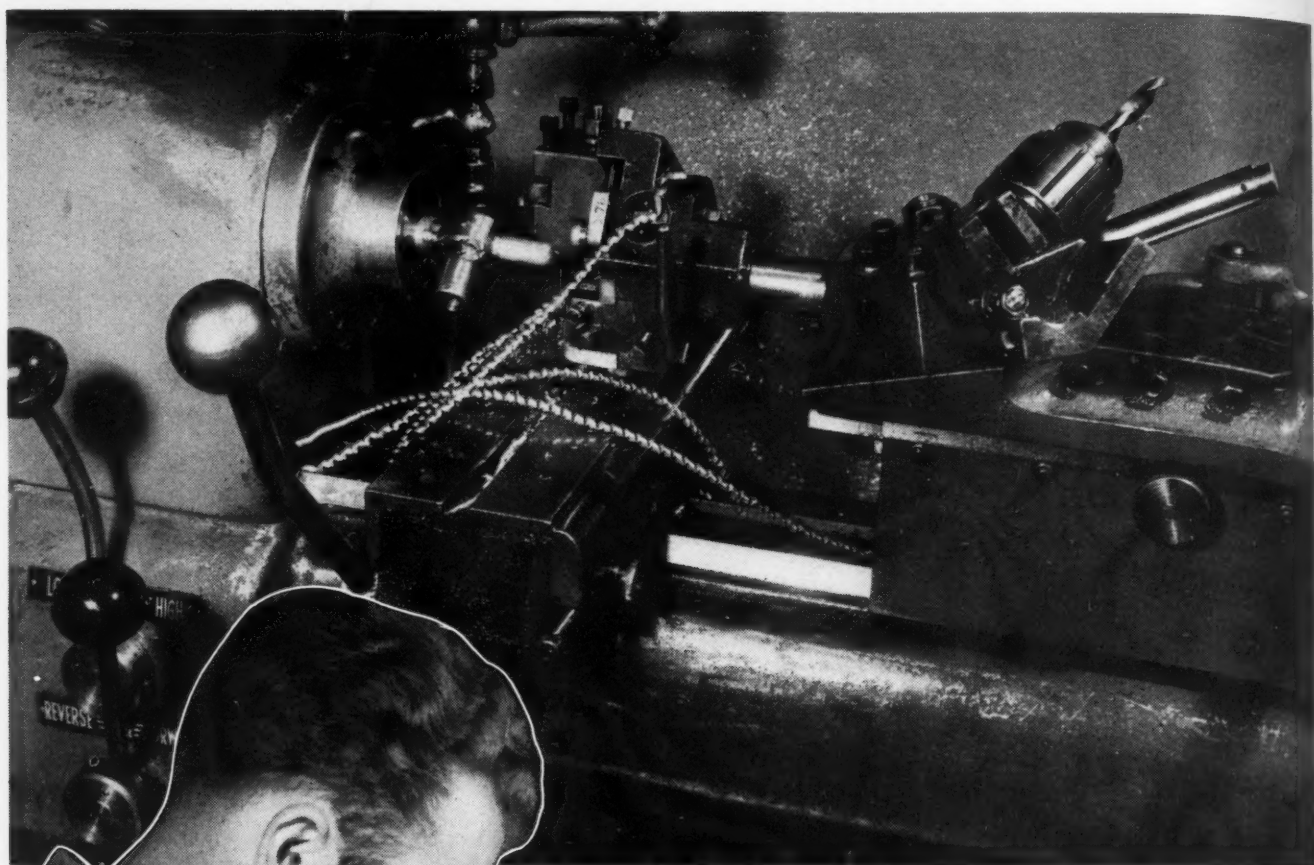
When automotive plants were converted . . . almost over night . . . to war-time production, ingenuity was imperative. Most manufacturers were confronted with an entirely new set of production demands, without specially designed machine tools to meet them . . . nor were such machines available. They were obliged to make the best of what they had. With NEWTON Milling Machines this was possible. They proved their worth in that emergency as they do in production. Postwar, CONSOLIDATED machines, of latest design, will be available, offering almost unlimited possibilities for mass parts production in many diversified lines.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

**C O N S O L I D A T E D**  
**M A C H I N E T O O L C O R P O R A T I O N**

ROCHESTER 10, NEW YORK



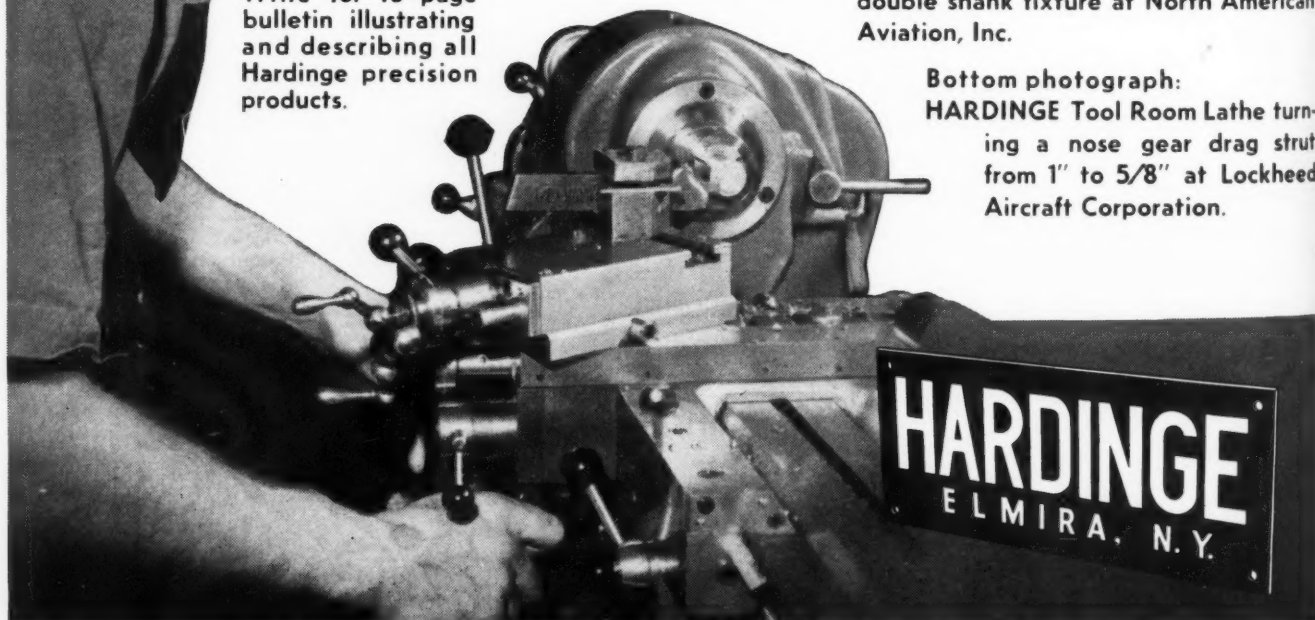


# **HARDINGE** means precision performance to the Aviation Industry

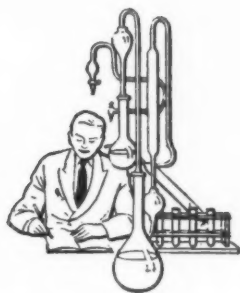
Top photograph: HARDINGE Second Operation Machine set up to drill, turn and undercut a 24 S.T. aluminum alloy casting held in a double shank fixture at North American Aviation, Inc.

Write for 16-page  
bulletin illustrating  
and describing all  
Hardinge precision  
products.

Bottom photograph:  
HARDINGE Tool Room Lathe turn-  
ing a nose gear drag strut  
from 1" to 5/8" at Lockheed  
Aircraft Corporation.







# *"Sterling" Stainless Steels*

**FOR DISCRIMINATING USERS**

## **A complete line of wire, rod and bars**

**F**IRTH-STERLING—a mill with a national reputation for consistently high quality Tool and Alloy Steels—is in a unique position to meet the special requirements of discriminating users of Stainless Steels. Since

1913, when FIRTH-STERLING made the first Stainless Steel produced in this country, we have specialized on made-to-order types for the most exacting specifications. Literature is available, giving complete details.

### **"Sterling" Stainless Steels Meet Special Requirements such as:**

1. Closely Controlled Compositions.
2. Exacting Physical Requirements.
3. Surface Perfection in Various Finishes.
4. Precise Size and Shape Tolerances.

### **Ask For:**

*Bulletin No. SL-2009* on Types 420, 440-A, 440-B, and 440-C.

*Bulletin No. SL-2010* on Types 403, 410, and 416.

*Bulletin No. SL-2011* on Types 302, 303, and 304.

*Bulletin No. SL-2018* on Cold Finished Stainless Steels.

Makers of  
Fine Stainless  
Steels Since  
1913

## *Firth-Sterling*

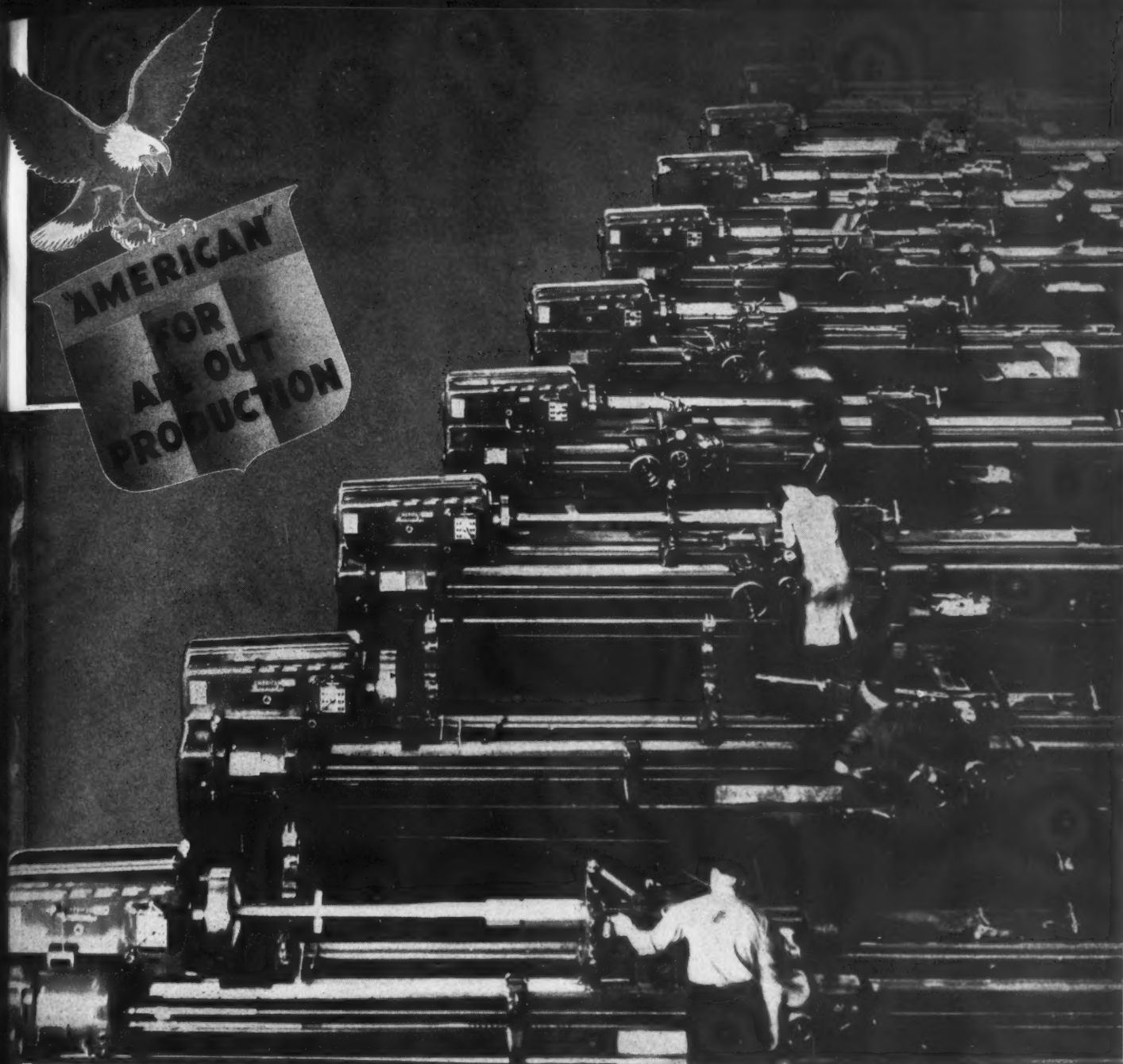
**STEEL COMPANY**

Offices: McKeesport, Pa. New York - Hartford - Philadelphia - Cleveland - Dayton - Detroit - Chicago - Los Angeles

*Guns by the Thousands!!*

and Row upon Row of  
**"AMERICAN"  
PACEMAKER LATHES**





## ...producing them in the Plant of **THE DOMINION ENGINEERING CO.**

Our fighting forces need guns and more guns and they are getting them in ever increasing numbers.

In the gun plants of this country and Canada "AMERICAN" Lathes are meeting every challenge of increased schedules. They are producing as they never produced before and at the same time are maintaining amazing standards of accuracy.

For all-out production, call on "AMERICAN".

**THE AMERICAN TOOL WORKS COMPANY**

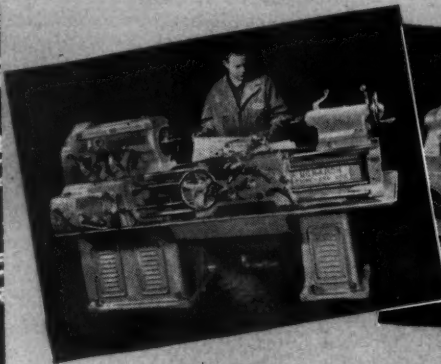
*Lathes and Radial Drills*

CINCINNATI, OHIO, U. S. A.

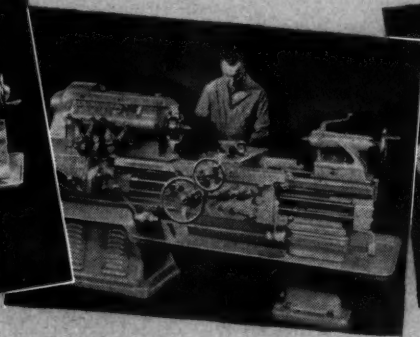


# Cut turning time with M

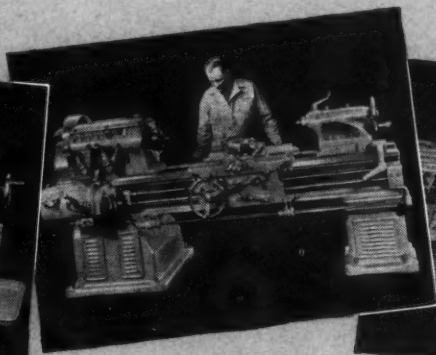
The only way in which American industry can meet higher wage rates is to increase the productivity of machines. Many machines which were "good enough" before the war will not meet postwar demands. We suggest you ask a near-by Monarch representative for details on how Monarch Lathes will reduce turning time and costs . . . and help you be ready for your postwar requirements.



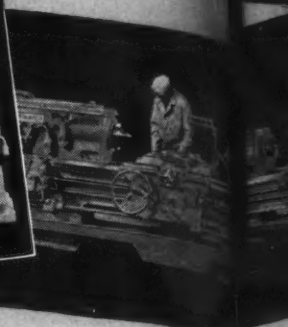
12' x 30' Monarch Lathe



14' x 30' Monarch Lathe;  
also made in size 16' x 30'



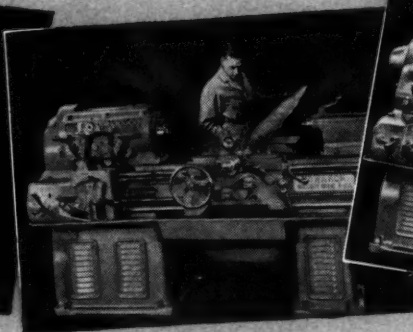
18' x 48' Monarch Lathe



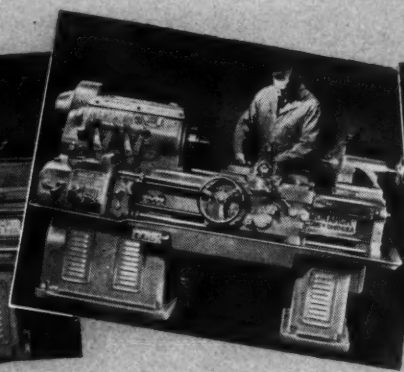
20' x 48' Monarch Lathe  
also made in size 22' x 48'



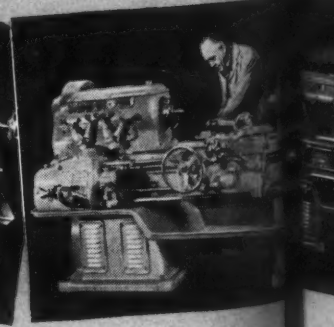
10' x 20' Monarch Sensitive  
Precision Toolmaker's Lathe



12' x 30' Monarch  
Toolmaker's Lathe



14' x 30' Monarch  
Toolmaker's Lathe



16' x 30' Monarch  
Toolmaker's Lathe

## DIRECT FACTORY BRANCHES AT:

622 West Washington Boulevard,  
Chicago 6, Illinois

801 Fisher Building,  
Detroit 2, Michigan

512 Empire Building,  
Pittsburgh 22, Pennsylvania.

Representatives in principal cities.

1060 Broad Street,  
Newark 2, New Jersey

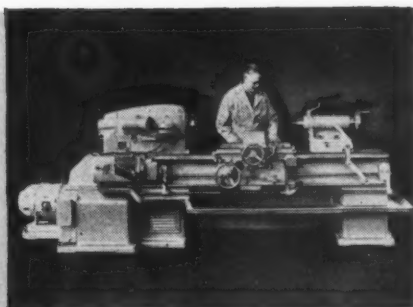
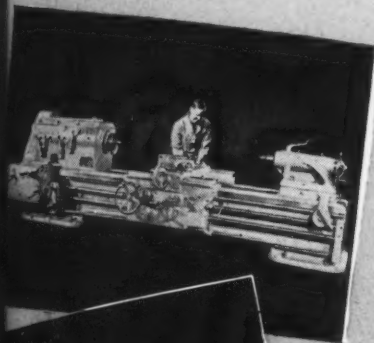
10465 Carnegie Avenue,  
Cleveland 6, Ohio

# Monarch

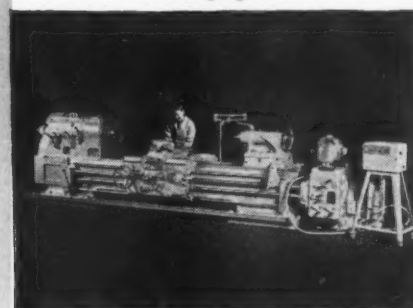
THE MONARCH MACHINE TOOL

# Monarch Lathes!

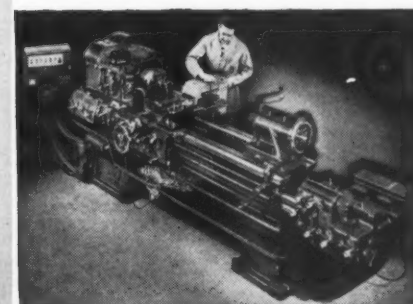
30" x 60" Monarch Lathe;  
also made in size 36" x 60"



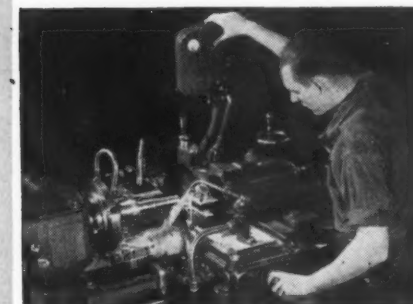
20" x 48" Stepless Spindle Speed  
Drive Lathe with constant surface  
cutting speed



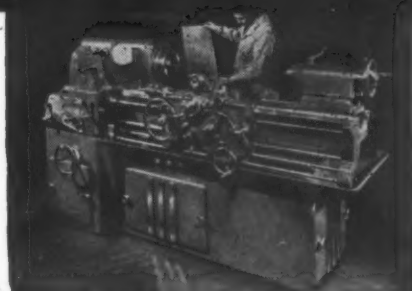
36" x 60" Monarch-Keller Lathe



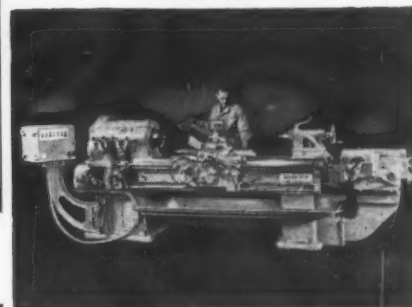
SHAPEMASTER with Keller  
Electric Controls



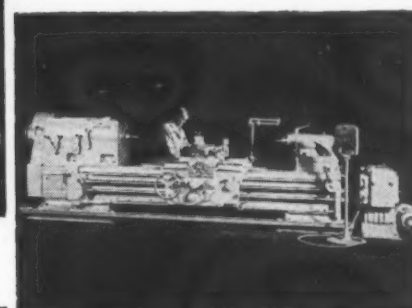
48" Monarch Toolmaker's  
Lathe; also made in size 20" x 48"



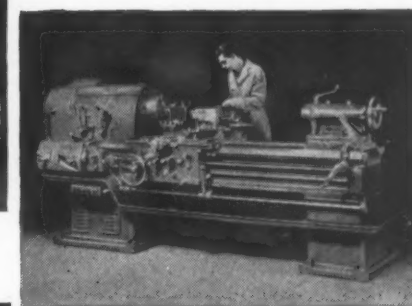
12" x 30" Stepless Spindle Speed  
Drive Lathe with constant surface  
cutting speed



16" x 54" Monarch-Keller Lathe



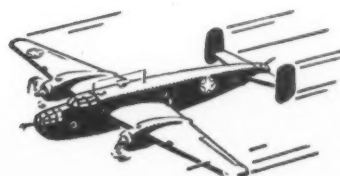
36" x 60" Monarch Automatic  
Sizing Machine



Standard Monarch  
SHAPEMASTER

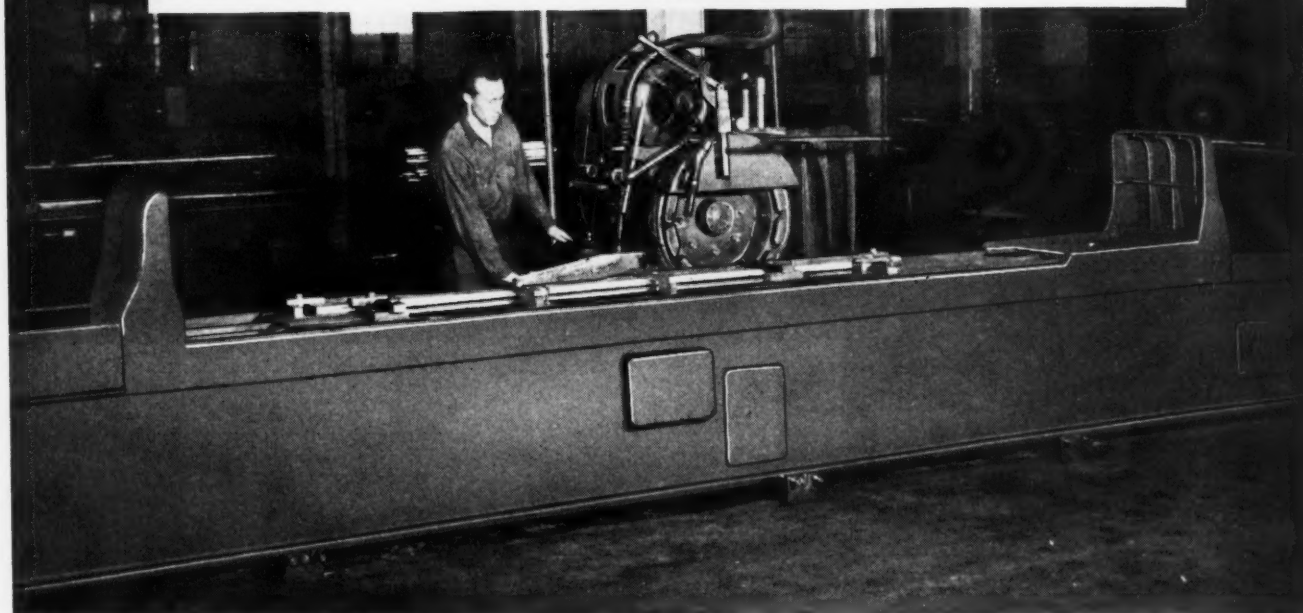
Monarch All-Electric Full  
Automatic Lathe

## Saves Time

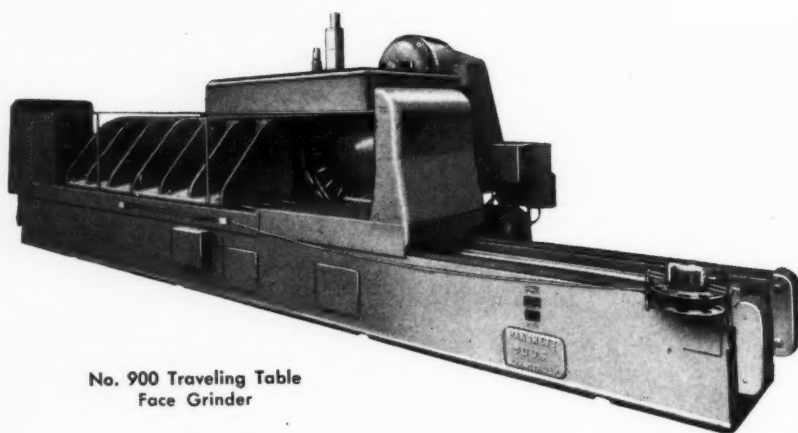


COMPANY . SIDNEY, OHIO

## EXAMPLE: Edge-Grinding Armor Plate to .005" Tolerance\*



Series 4000 Hanchett Hydraulic Traveling Table Face Grinder in operation at McInerney Spring & Wire Co., Grand Rapids, Mich.



No. 900 Traveling Table  
Face Grinder

In the above illustrated example of edge-grinding armor plate for welded tanks and combat cars the Hanchett 4000 Traveling Table Face Grinder is doing a job accurately to .005" tolerance and consistent with the time demands of a speeded war effort. \*In many instances tolerances of .0005" are maintained on a production basis. For continuous, trustworthy performance this machine cannot be outperformed for the job it is doing day and night through long grueling hours of production punishment.

Made in five sizes, this machine has range to finish hundreds of jobs, large or small. Operators like its handling ease and time-saving centralized controls, always within reach. For full information on Hanchett Traveling Table Face Grinders, write for Bulletin 170M-10.

Series No.	HP	Wheel Size	Table Width
900	40	36"	24"
1000	30	30"	24"
2000	25	30"	22"
3000	20	24"	22"
4000	15	20"	20"

Table lengths: 50 inches to 24 feet.

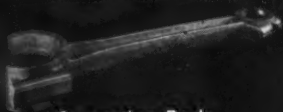


IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

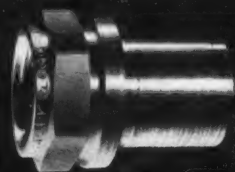
**HANCHETT MANUFACTURING CO.**  
BIG RAPIDS, MICHIGAN U.S.A.



# SURFACE BROACHING *for the* AUTOMOTIVE INDUSTRY



Connecting Rods



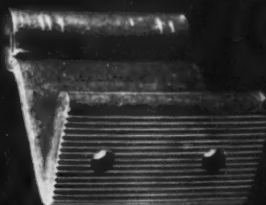
Spark Plugs



Front Axle Spindle



Carburetor



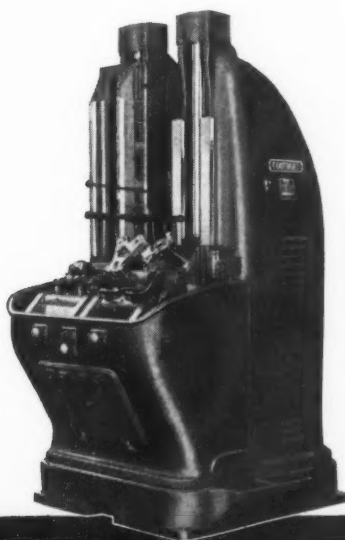
Door Hinge

★ In the automotive field Footburt Surface Broaching Machines are used for machining a wide variety of large quantity items. Bearing caps, connecting rods and caps and other parts that must be held to close limits are being surface broached at remarkably high production rates. On parts such as spark plug bodies and spring shackles the parts are indexed during the broaching operation so that the work is completed with one clamping in the fixture. There are still many places where war contracts can be speeded up now and there are countless parts that need the benefits of surface broaching in the competitive days ahead. May we discuss with you the possibility of applying surface broaching to your product.

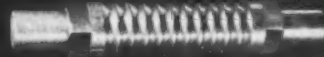
## THE FOOTE-BURT COMPANY

CLEVELAND 8, OHIO

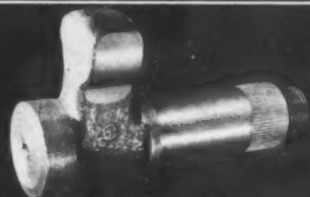
Detroit Office: General Motors Building



# FOOTBURT *Surface* BROACHING



Spring Shackle



Steering Gear Lever



Connecting Rod Caps



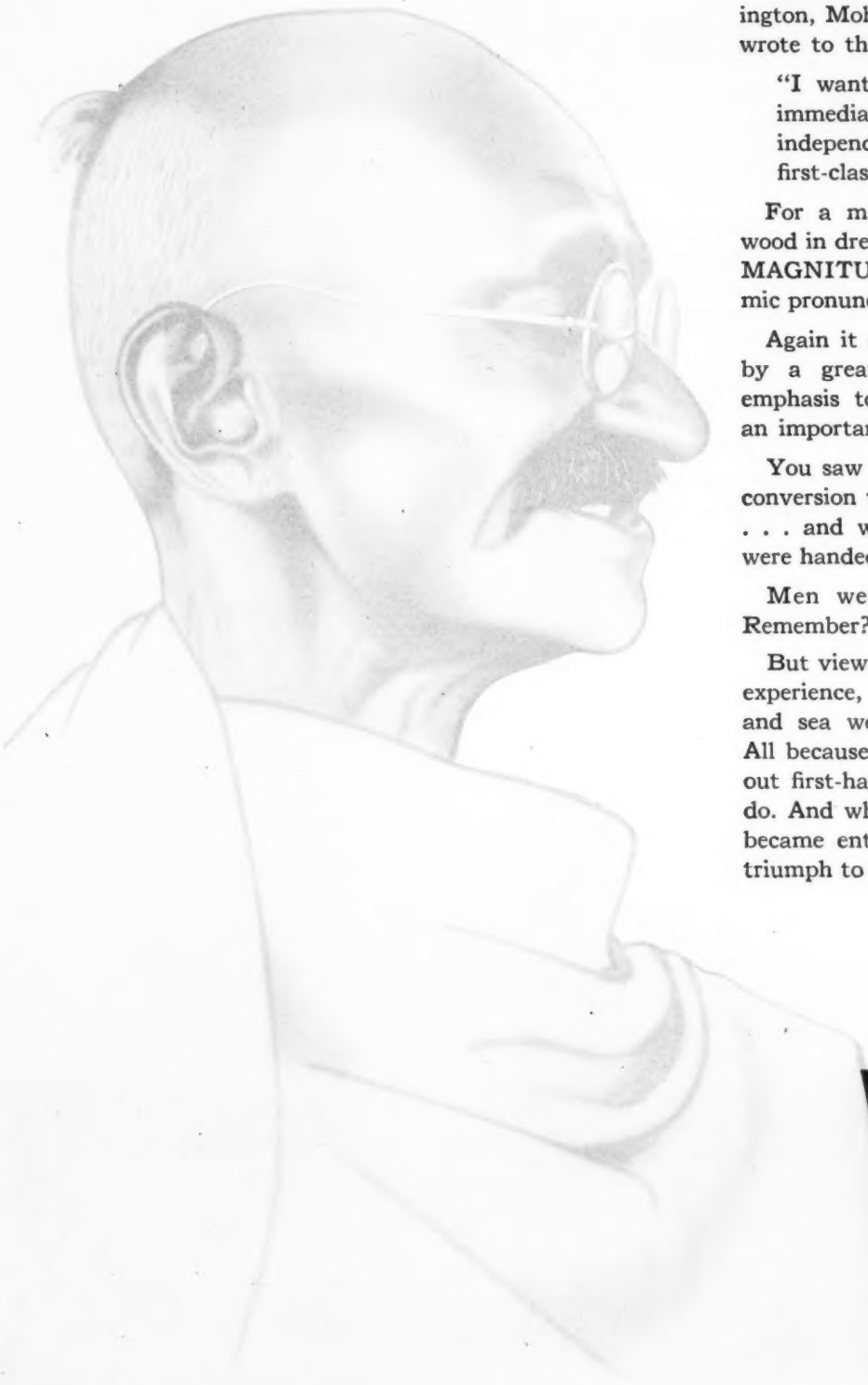
Shifter Yoke



Manifold Spacer

*Then he said to himself*

## "A War Measure of First-Class Magnitude"



**W**HEN the standing of India was occupying the attention of Washington, Mohandas Karamchand Gandhi wrote to the India League of America:

"I want you to look upon the immediate recognition of India's independence as a war measure of first-class magnitude."

For a man so definitely non-Hollywood in dress or words "**FIRST-CLASS MAGNITUDE**" amounts to a cataclysmic pronouncement.

Again it shows that one who is fired by a great idea automatically adds emphasis to enthusiasm! And *that* is an important business measure.

You saw it well illustrated when war conversion was hurled at manufacturers . . . and when "impossible" schedules were handed them.

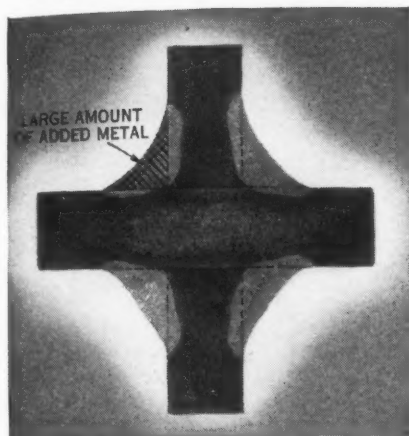
Men were far from enthusiastic. Remember?

But viewed in the light of subsequent experience, those quotas for air, land and sea weapons today seem modest. All because aroused men quickly found out first-hand what Arc Welding could do. And when it did the job well, they became enthusiastic . . . which brings triumph to any front.

le"

# "A War Measure of First-Class Magnitude"...he says

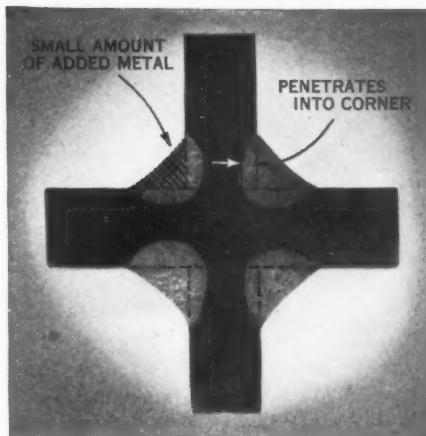
## CONVENTIONAL WELDING



TYPICAL FILLET WELDS

**STRENGTH:** Stronger than plate  
**SPEED:** 5" per min.  
**COST:** 100%

## "FLEET-WELDING"



**STRENGTH:** Stronger than plate  
**SPEED:** 12" per min.  
**COST:** 42%

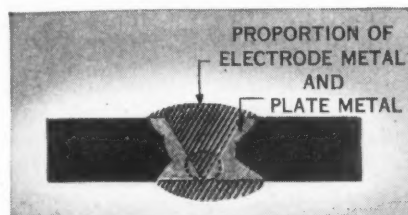
**LOOK, MAHATMA:** While you pondered on the magnitude of political measures for winning, Lincoln Engineers were enthusiastically working out a very practical measure that is away out in front in magnitude:

## "FLEET-WELDING"

**A First-Class Production Measure  
 ... of First-Class Magnitude**

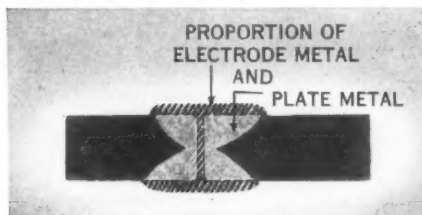
This new, revolutionary technique using "ARC-FORCE" to speed the welding of all types of joints in plate, shapes and sheet is bringing back reports of 25% to 75% faster welding ... also savings in electrode material and power. Cases also are reported where back-chipping and plate beveling are eliminated.

The savings shown at left are typical of this new technique developed by Lincoln engineers.



TYPICAL BUTT WELDS

**STRENGTH:** Stronger than plate  
**SPEED:** 2" per min.  
**COST:** 100%



**STRENGTH:** Stronger than plate  
**SPEED:** 9" per min.  
**COST:** 25%



*A Lincoln engineer is available nearby to help you apply "Fleet-Welding" Technique. Write for Bulletin No. 440 which gives complete explanation of the simple technique and the welding procedures.*

**THE LINCOLN ELECTRIC COMPANY  
 CLEVELAND, OHIO**

*America's greatest natural recourse*  
**ARC WELDING**



# RACE-A-WAY GRINDER

## *Races for Victory*

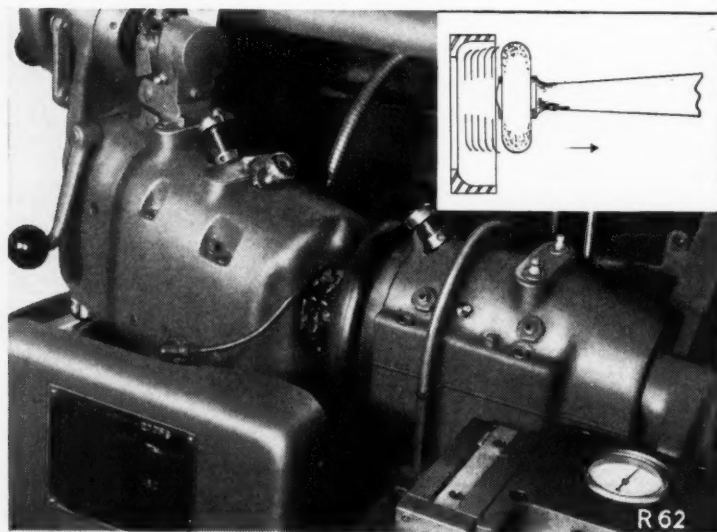


The tremendous demand for Ball Bearings created by the mechanized weapons of World War II has been very successfully met by LANDIS No. 1 and No. 2 Race-A-Way Grinders.

Production grinding of small ball bearing outer races has, in the past, been a very real problem. The LANDIS No. 1 is designed to grind, rapidly and accurately, races up to and including No. 204 size. This machine handles double as well as single row races. Very small size races must be submitted to our Engineering Department for its recommendation.

Continuously high output of controlled quality small races has been made possible by the combination of Automatic Grinding Cycle and 30000 or 50000 rpm Wheel Spindles. The past four years' production records of the Bearing Industry are evidence of this machine's ability to deliver. Together with the LANDIS No. 2 it has been at work in all major bearing plants turning out a solid stream of races for the varied and complex applications occasioned by military requirements.

Your request for a bulletin, or an engineer's visit, will receive prompt attention.



GRINDING THE LAND TANGENT TO  
THE GROOVE-IN ONE OPERATION

# LANDIS TOOL

*Precision Grinders*



# RACE-A-WAY GRINDER

## *Races for Victory*

The LANDIS No. 2 Race-A-Way Grinder may be tooled for internal or external races. The internal grinding machine has capacity to handle single row races up to and including the 212, 311 and 409 groups. Single row races up to and including the 218, 316 and 414 groups may be handled by the external machine.

Tooling can be furnished for double row races having a groove spacing of not more than  $1\frac{3}{8}$ " ; maximum O.D. for double row races is 5".

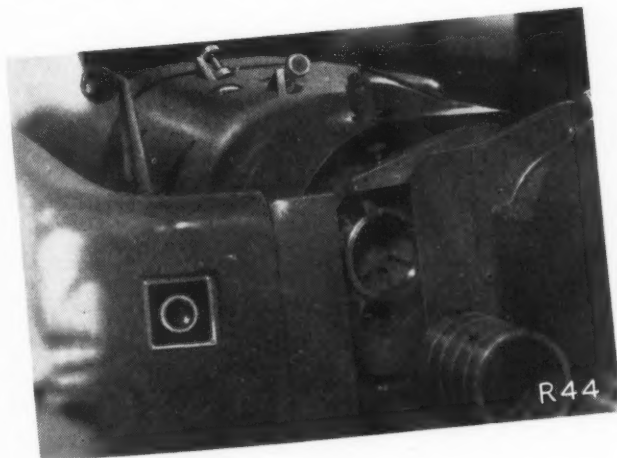
On both the No. 1 and No. 2 Race-A-Way Grinders set-up, inspection and adjustment are simplified, with

resulting production increases. Naturally, from the user's point of view, high productivity is desirable if the several bearing quality grades can be obtained. This machine, and the smaller No. 1, through Automatic Grinding Cycles and correctly determined Wheel Spindle Speeds increase what has been previously accepted as normal output. This is particularly interesting because operator acceptance is established.

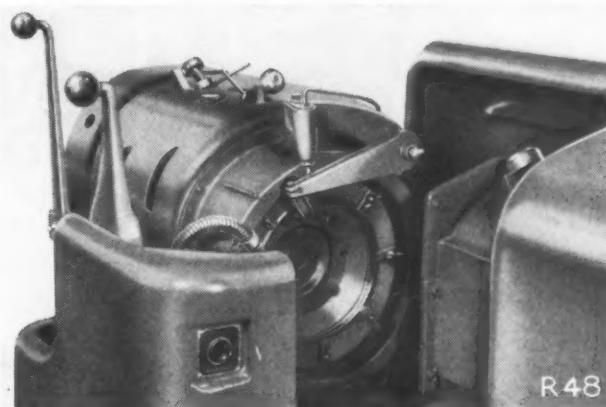
Manufacturers making more than one type of anti-friction bearings will find LANDIS experience helpful. May we put it to work for you?

444

TYPICAL INTERNAL GRINDING OPERATION



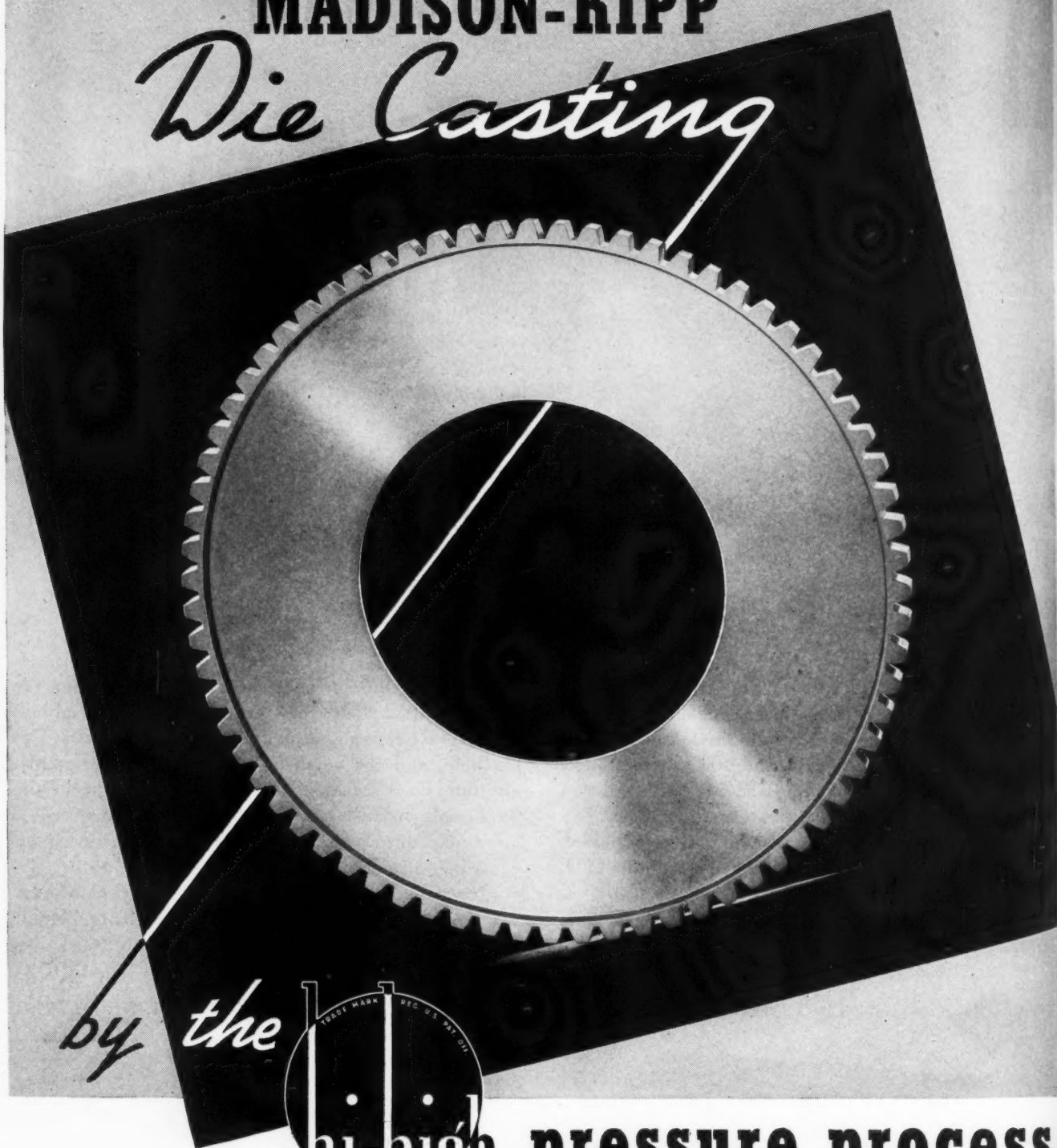
INTERNAL OPERATION ON LARGER THAN AVERAGE RACE



LANDIS TOOL CO. • WAYNESBORO, PENNSYLVANIA

MACHINERY, August, 1944—29

# MADISON-KIPP *Die Casting*



*by the*

**hi-high**

## **pressure process**

**LIGHT, STRONG, ATTRACTIVE, DURABLE**

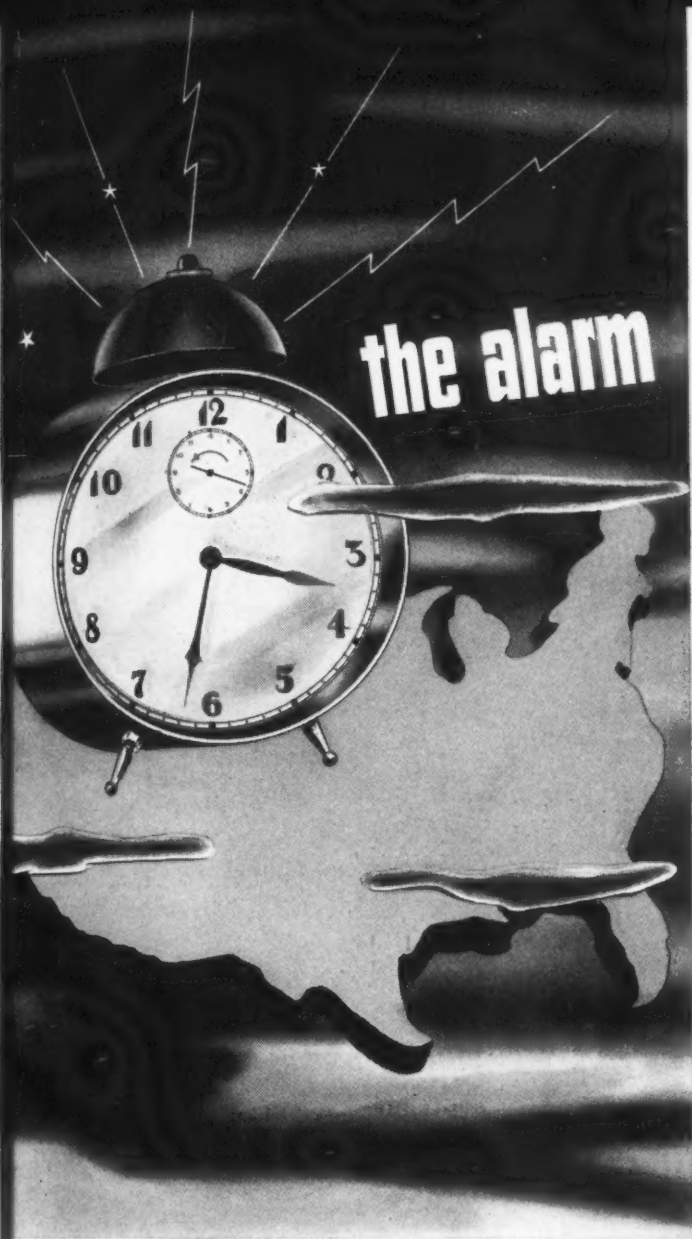
Before the patented hi-high pressure process was developed the above part was "not suitable for die casting"

But die casting reached its present important position to the mechanical industries by challenge. Good mechanics with great determination have applied themselves to invent, pro-

duce, and promote one success after another. You may find that die casting will offer you a really great advantage in your present as well as your post war plans.

Madison-Kipp Corporation, 203 Waubesa St. Madison 4, Wisconsin. Sole Agent in England Wm. Coulthard & Co., Ltd., Carlisle.





**rang months ago!**

At 3:32 A. M. Eastern War Time, June 6, 1944, the official announcement of the invasion of "Fortress Europe" was released by General Dwight D. Eisenhower. It marked the opening of the second front—the greatest event of all time... the beginning of the end of the war. It sounded the alarm for management to wake up and definitely plan for peace.

To talk about postwar plans is not enough. Now is the time for actual, factual planning and doing if private enterprise is to survive. *The alarm rang months ago.*

Now is the time to plan your new installations of machine tools—to actually place your orders—to prepare for the day when you will have to supply more and more peace-time goods at lower cost.

LeBlond is making Tomorrow's Cost-Downing Lathes Today. A study of their exclusives and many other features will convince you that LeBlond's are the turning tools that belong in your "peace work" production program. Write today for your copy of LeBlond Lathe Bulletins. Use the coupon.

THE R.K.

**Le BLOND**

**MACHINE TOOL CO., CINCINNATI, 8**

NEW YORK 13,  
103 Lafayette St.  
CAnal 6-5281

CHICAGO 6,  
20 N. Wacker Dr.  
STA 5561

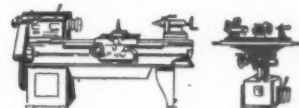
**Check-Clip-Mail**

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME \_\_\_\_\_ TITLE \_\_\_\_\_  
YOUR FIRM \_\_\_\_\_ ADDRESS \_\_\_\_\_

★ YOUR BONDS BUY BOMBS ★  
**BUY A "BLOCK-BUSTER" TODAY!**



Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

**time to retool**  
*Turn to LeBlond for Turning Equipment*  
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

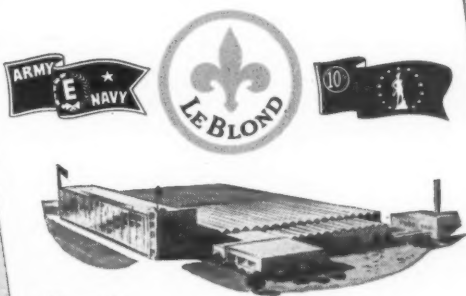
Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

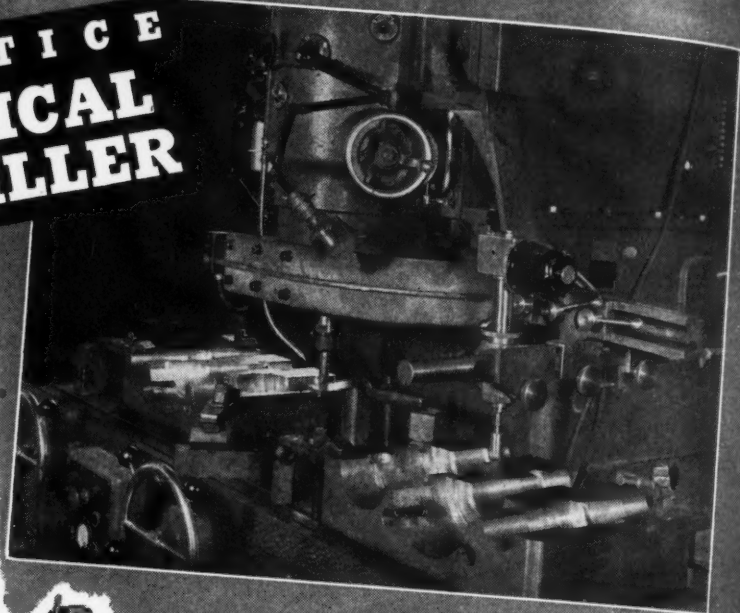
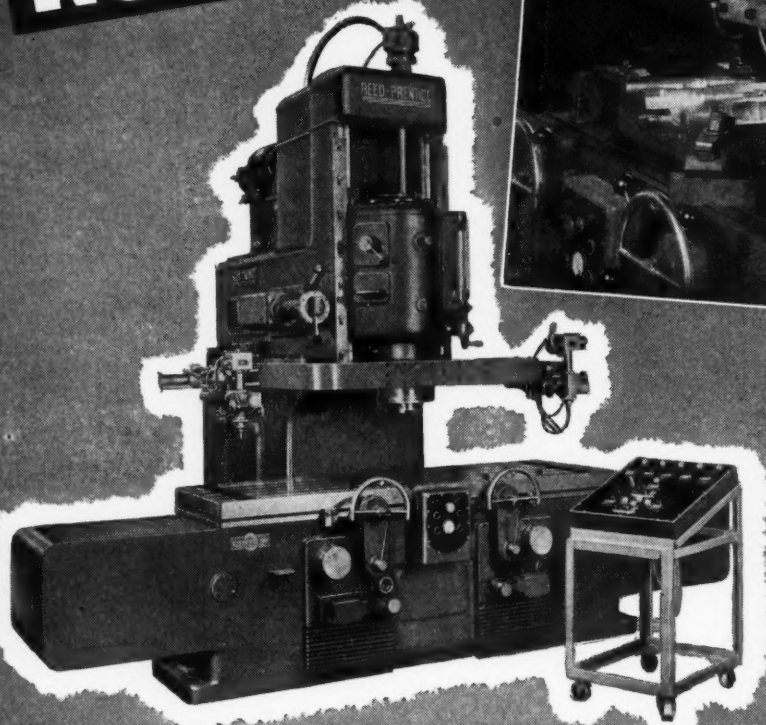
Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.



# REED-PRENTICE No. 4 VERTICAL MILLER



Close-up of a No. 4 Miller installation with single duplicator in die sinking operation.

Reed-Prentice No. 4 Vertical Miller with dual duplicating attachment.

## ... with Dual or Single Duplicating Attachment.

In construction and control of operation, the Reed-Prentice No. 4 Vertical Miller represents exceptional engineering achievement. The capacity and precision of this Miller with single or dual duplicating attachment has accumulated outstanding records of

performance both for milling and die sinking. The No. 4 Miller ranks high in modern machine tool development.

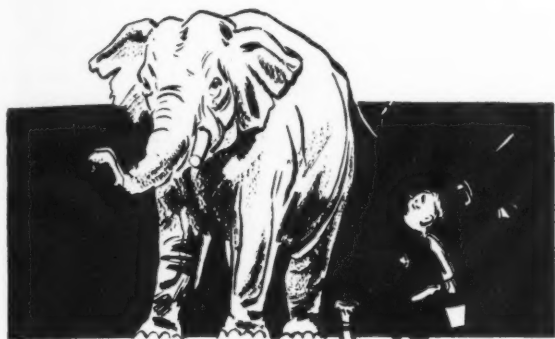
The Reed-Prentice No. 4 Vertical Miller is also adaptable for negative rake milling. Particulars supplied on request.



NEW YORK OFFICE  
75 West St.  
New York 6, N. Y.  
CLEVELAND OFFICE  
1213 W. 3rd St.  
Cleveland 13, Ohio

LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATI

AUGUST, 1944



**Jerky action of gun-rifling broaches** is often caused by the weight of heavy broach and ram breaking down the lubricating film of ordinary lubricants used on ways. One broach maker found Stanolox 31 just what he needed. Because of the filter used in the system for

A detailed black and white illustration of a hand holding a pocket watch. The hand is rendered with fine lines and shading, showing the fingers gripping the watch. The watch has a round face with a white dial, black Arabic numerals from 1 to 12, and two hands. The watch is held in a way that the face is clearly visible. The background is a simple, textured grey.

*Gasoline Powers the Attack . . . Don't Waste a Drop!*

**STANDARD  
SERVICE**

## ★ LUBRICATION ENGINEERING



# 1 oil does these 3 jobs better than many special oils

THREE most frequent uses of oil in your plant—outside of power generating equipment—are probably in gear cases, air compressors, and hydraulic systems. As widely different as these three jobs may appear to be, one oil—Stanoil—has qualities that fit each use better than many special purpose oils. It offers these advantages:

1. It means one brand of oil to handle and keep in stock in place of three.
2. There is less chance for misapplication of lubricants with fewer oils from which the oiler must choose.
3. It simplifies procedure when oil is reclaimed or re-used for other services.
4. There is one convenient source of supply to contact.

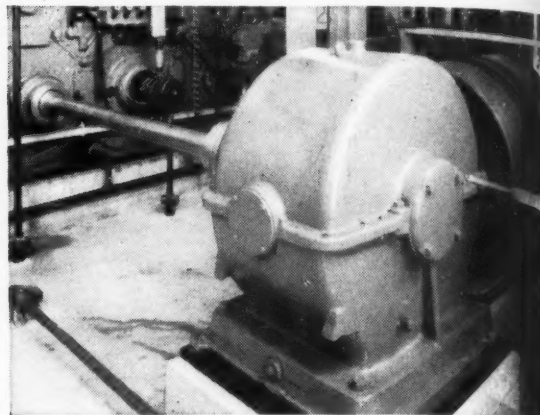
These are *plus* advantages. In addition, Stanoil does an outstanding lubricating job wherever it applies. Let a Standard Oil Lubrication Engineer help you standardize your lubrication requirements by applying Stanoil wherever it can be used throughout your plant. Call your local Standard Oil Company (Indiana) office, or write 910 S. Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

★  
**STANOIL**  
★

**STANDARD OIL COMPANY (INDIANA)**

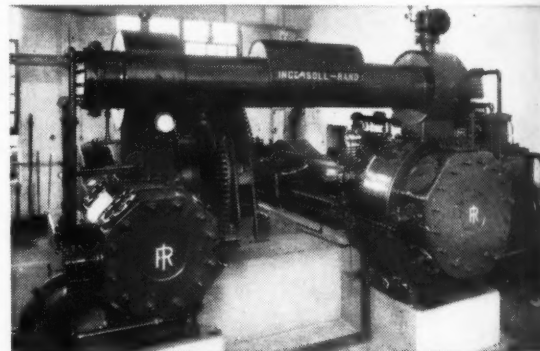
## Stanoil as a **HYDRAULIC OIL**

High viscosity index—an oil's ability to resist changes in viscosity with changes in temperature—is one of the qualities that recommend Stanoil for hydraulic systems. It flows readily at starting temperatures, yet it does not thin out excessively at high operating temperatures, thus providing more uniform operation. High stability against oxidation is another quality of Stanoil that adds to oil life. It prevents the formation of deposits that are so objectionable in hydraulic systems.



## Stanoil as a **GEAR CASE OIL**

High stability of Stanoil is also an advantage in gear cases of speed reducers. Stanoil resists oxidation caused by agitation in the presence of air—a condition natural to speed reducer operation—and prevents the formation of deposits caused by oxidation. Low pour test is a quality of Stanoil which eliminates starting trouble where gear cases are exposed to low temperatures.



## Stanoil as a **COMPRESSOR OIL**

The low carbon-forming tendencies of Stanoil are a great advantage in compressor lubrication. Oxygen in the air and heat generated by compression tend to oxidize oils in compressor service. Again Stanoil's high stability resists oxidation and reduces troublesome valve deposits.

*Gasoline Powers the Attack . . . Don't Waste a Drop!*

★ LUBRICATION ENGINEERING

STANDARD  
SERVICE

## "Turning Points" to Victory



*Photo, courtesy of Caterpillar Tractor Co.*

## "BATTLE-SMOKE" . . . U.S.A.

Akin to the smoke of battle are the billowing dust clouds of our active farm front. If this powerful tractor did not gain its crop objectives, its gun-toting cousins overseas might fail in theirs. Every attack may be said to start from American soil — ploughed, planted and harvested to energize every military attack.

Ball bearings are important "turning points" in this machine as in any Axis-blasting tank. Because here, too, ball bearings must deliver friction-free power in spite of

dust or mud, and under all conditions of temperature. And this is precisely what Fafnir Ball Bearings assure — the full transmission of power plus protection from elements which seek to impair it.

Nor will the benefits of Fafnir Ball Bearings end with wartime service. They will continuously afford full employment of power to ease man's work and promote his prosperity in the era of peace. The Fafnir Bearing Co., New Britain, Connecticut.

# FAFNIR BALL BEARINGS



*Buy War Bonds  
and Stamps*

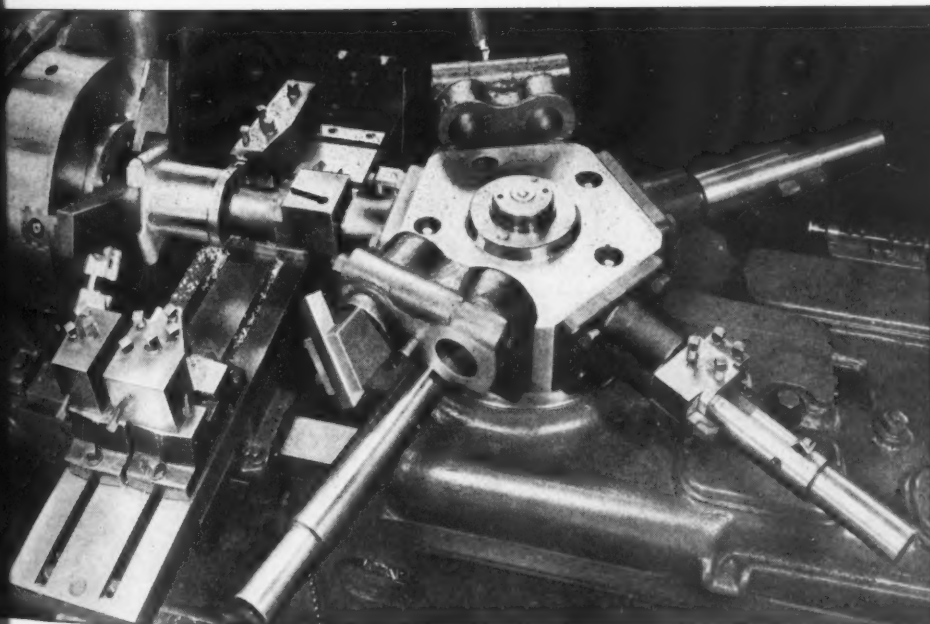




# RUSH

P&J engineers always had an active part in cooperative efforts with aircraft engineers in the development of high speed machines and special tooling. Since America's participation in the war, such cooperation was intensified; roles played by P&J Automatics in attaining new production achievements have become increasingly important.

Today P&J Automatics predominate in the machining of certain aircraft parts which present the most serious machining problems to manufacturers. Although operations are handled in many different ways to suit individual requirements, P&J Automatics and tooling produce both a qualitative and a quantitative increase in the output of parts marked RUSH, particularly where new design alterations can be accommodated by an easy changeover, and where the extreme rigidity of the P&J set-up permits the use of the various high speed cutting alloys under maximum feeds and speeds. In most cases a battery of P&J Automatics can be handled by one operator, thus releasing manpower for other essential work. Potter and Johnston Machine Company, Pawtucket, R. I.



# Capsules OF LIFE OR DEATH!

Valves—that's what these are—and their innocent appearance serves only to conceal their importance. For these valves are to modern warfare what the famous "horseshoe nail" (for the want of which the battle was lost!) stood for in the simpler fighting days of two hundred years ago. Designed for the control of oil, gas and other fluids, they are in active wartime service in aircraft of all types on every fighting front.

The four Weatherhead plants have long been fully engaged in making vital parts for the nation's

war machines at the rate of more than a million a day—and are prepared to make the same gigantic contribution to the peacetime needs of the nation!

Look Ahead with

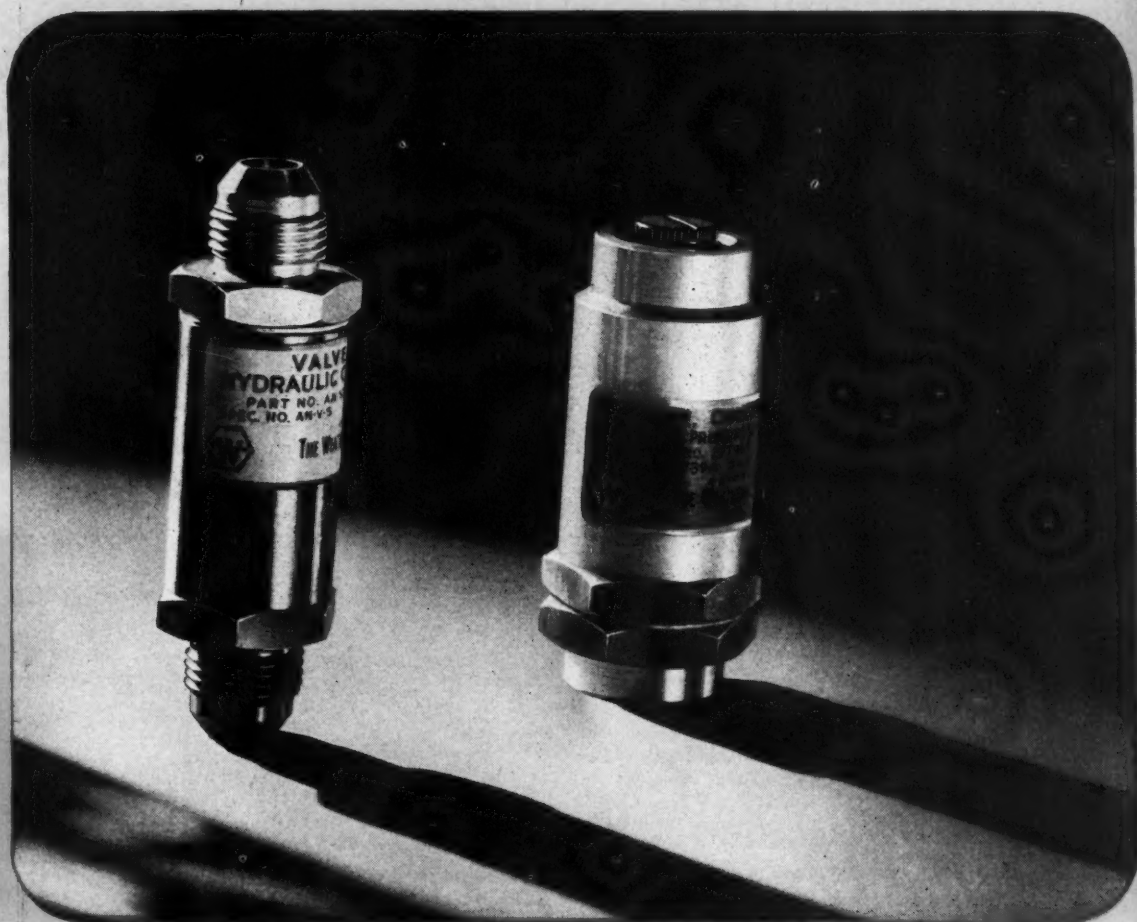


## Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

*Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.*

Plants: Cleveland, Columbia City, Ind., Los Angeles  
Canada—St. Thomas, Ontario



**FREE:** Write on company letterhead for "Seeds of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.



who dares to talk to them about a

## THIRD WORLD WAR?

They were at Tarawa.

Many of them now wear empty sleeves, or bandages where their eyes were. And a thousand and twenty-six will rise up never from the sands of Tarawa Island.

They couldn't hear it. In the roar of that tornado, as they fought and fell, so far from the hills of home, they couldn't hear the words: "... history repeats ... and what will we get out of it but ... how the hell can we police ... the next one will be against ... already sowing the seeds for ... and twenty years from now, brother ... the Third World War ..."

In elevators, on the street, in plush chairs that let you down easy, in columns and editorials and from the political stump.

What is the matter with us? Can't we at home at least go into peace with some spark of their courage and determination that this war is not another mockery, not just another World War? Let no man give voice to that weak and deadly cynicism. Let him stand up and think straight and have the courage to call the lie to any man in public or private life who fails to do the same.

And let each of us do everything humanly possible to help win this war sooner ... buy War Bonds—give blood—boycott the black market ... and plan ahead now for a better America than we had before.

Today, the engineers of the machine tool industry can greatly help the post-war planners of government and business management. One of these is a Bryant man ...

We invite you to send for him.



**BRYANT CHUCKING GRINDER COMPANY** SPRINGFIELD, VERMONT, U. S. A.

MACHINERY, August, 1944—39





**It is reported that . . . . .**

Vibrating chisels, similar to those used to break up pavements, are being tried out by dentists as an improvement over the familiar drill.

get ready with **CONE** for tomorrow

The rare metal, tantalum, unknown forty years ago, is being used in bolts, screws, and plates to repair the broken bones of wounded soldiers.

get ready with **CONE** for tomorrow

A gas-filled fuse, now used to detonate mines, will explode a charge three and one-half miles away in one second. It can be used under water and is itself a powerful explosive. Laid in a line cross-country, it will instantly clear a path through trees and brush or dig trenches.

get ready with **CONE** for tomorrow

A low priced ultraviolet lamp bulb is ready for the after-the-war market.

get ready with **CONE** for tomorrow

A noted aviation engineer and successful industrialist has plans for a revolutionary helicopter that uses a contra-rotating propeller, carries four passengers, and can be operated on a highway.

get ready with **CONE** for tomorrow

A new heat-resistant alloy is reported that uses silicon and manganese to replace part of the scarce nickel and chromium formerly used.

get ready with **CONE** for tomorrow

Fireproof cotton batting is now being made for upholstery and insulation.

get ready with **CONE** for tomorrow

A new iron is being made which has as much as five times the tensile strength of ordinary cast iron. With it, even cast iron springs can be made.

A plant has been built for processing large quantities of the lowly milkweed. The floss is a good substitute for kapok in upholstery, an oil for paint is made from the seeds, wallboard can be made from the stalks, and latex extracted from the leaves.

get ready with **CONE** for tomorrow

A new machine checks the size of ball bearings at rates as high as 20,000 per hour.

get ready with **CONE** for tomorrow

New sleeping cars have a triple deck arrangement of berths.

get ready with **CONE** for tomorrow

The "electric eye" can now be used to detect and warn of dangerous gases in the air.

First post-war models of television sight and sound receivers are expected to sell at from \$200 to \$700. Reception will about equal in quality the familiar 16 mm. motion pictures.

get ready with **CONE** for tomorrow

A new cream protects those of our Navy who are exposed to the risk of flash burns.

get ready with **CONE** for tomorrow

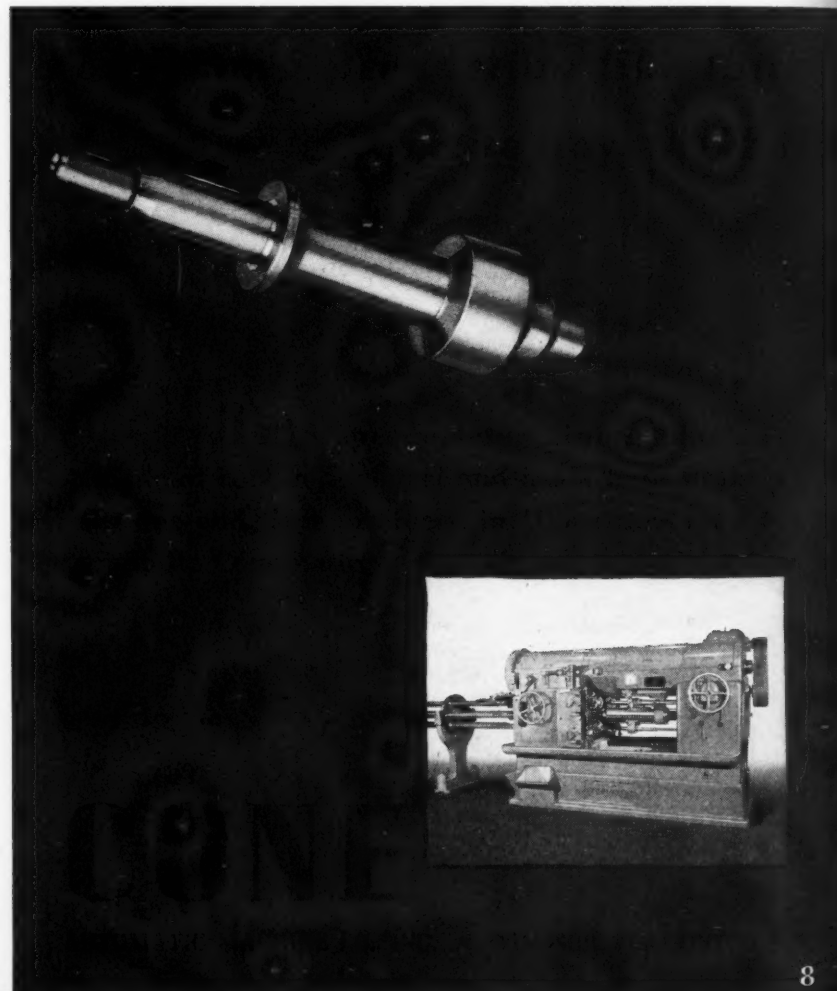
Coilsprings of Nylon, while not as strong as steel, will function indefinitely without breaking from "fatigue."

get ready with **CONE** for tomorrow

A new rubber sheeting perforated with 6,400 holes to the square inch is being used for filters.

get ready with **CONE** for tomorrow

A new microscope converts an invisible ultra-violet image into a visible full color picture without the use of photography or fluorescent screens.





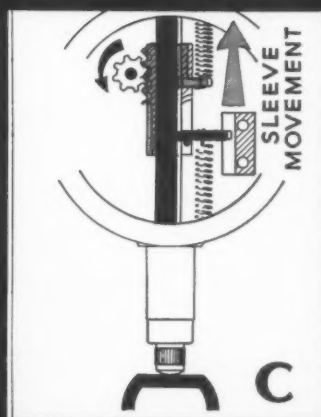
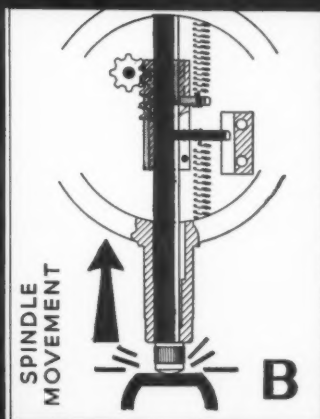
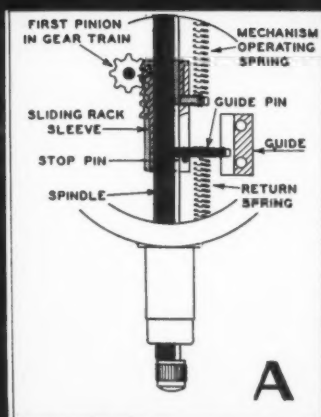
**STANDARD**

# SHOCKPROOF Dial Indicators

See How The SHOCKPROOF Action  
Protects the Precision Mechanism



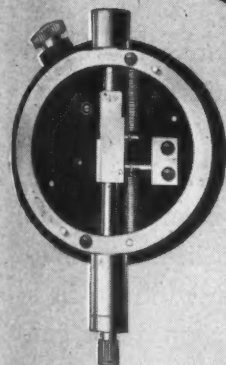
**22 MILLION BLOWS,**  
struck deliberately on a stock gage,  
failed to damage gear teeth, bear-  
ings or spindle, or impair the instru-  
ment's accuracy.



- A — Rest Position  
B — Sudden blow or contact by work piece raises spindle. For an instant guide pin moves away from contact with stop pin. This allows mechanism operating spring to raise the rack sleeve which is slidable on the spindle.  
C — Stop pin and guide pin resume contact after the mechanism operating spring has actuated the gearing. Relative position of spindle and rack sleeve is restored.

In actual use only the more sudden shocks against the contact point jar the spindle ahead of the rack sleeve. For normally applied contacts the sleeve and spindle move together as a unit. In any case the force on the mechanism is never any greater than the pull of the spring.

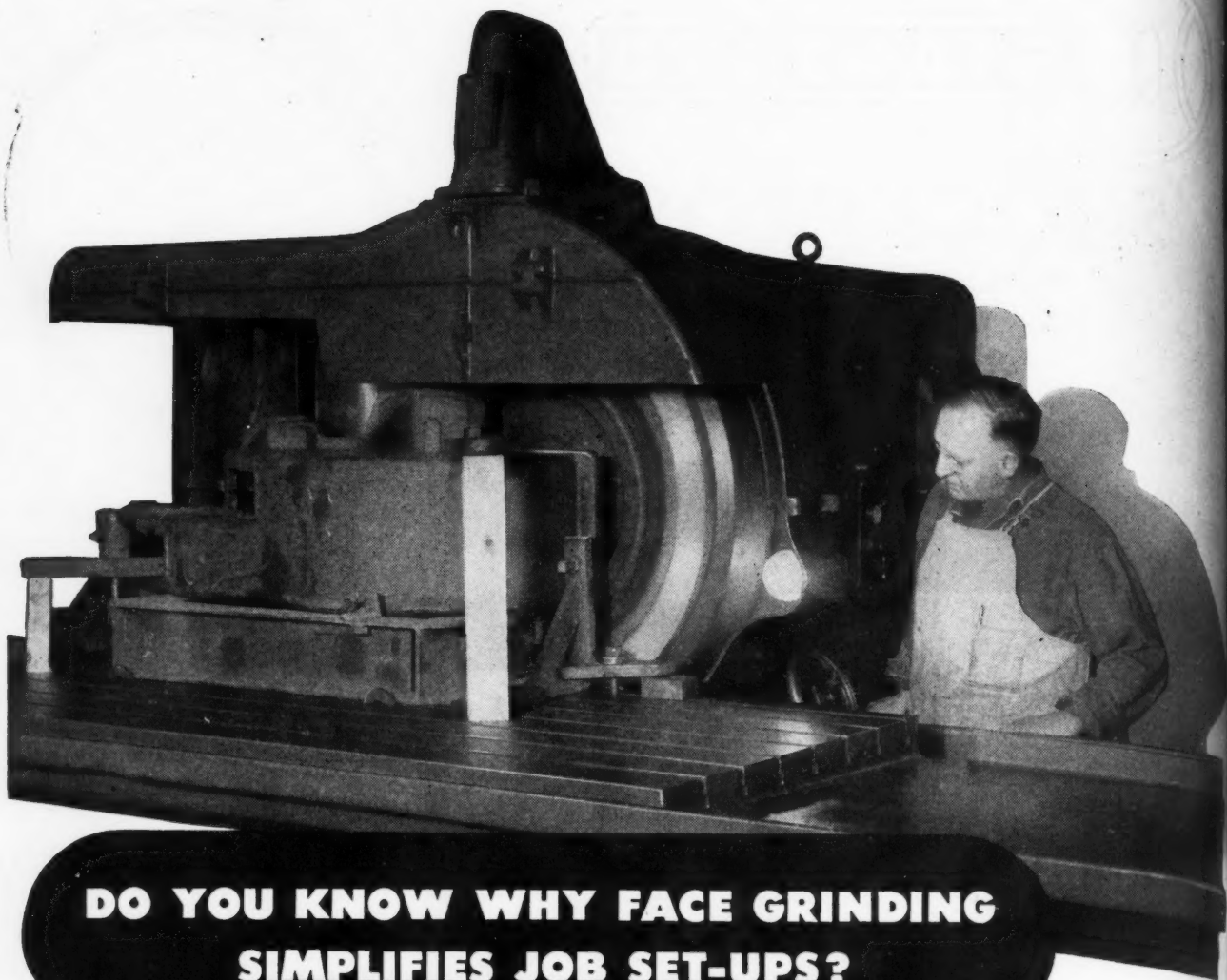
WRITE FOR COMPLETE CATALOG



Rear view of SHOCKPROOF  
Dial Indicator, cover re-  
moved, showing "Free Wheel-  
ing" mechanism.



**STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.**



## DO YOU KNOW WHY FACE GRINDING SIMPLIFIES JOB SET-UPS?

Some machining methods require complicated set-ups, due to the need for bracing in all directions against the forces of the cutting tool.

Face grinding with a Diamond Face Grinder eliminates these costly set-ups. Very often you can use fixtures made right in your own shop, improvised from scraps of metal or even wood. You save

time and material. You can set up jobs quickly and inexpensively as shown above.

Look into this and other advantages of Diamond Face Grinders. Mail the coupon for complete details. And remember, the Diamond Face Grinder requires no previous machining skill or knowledge. In a few days to a few weeks an operator can be trained for fast, accurate work.

Diamond Machine Company of Philadelphia  
2435 Aramingo Avenue, Philadelphia 25, Pa.  
Gentlemen: Send me your folder explaining the  
advantages of face grinding and features of the  
Diamond Face Grinder—"Philadelphia Type".

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

State \_\_\_\_\_

City \_\_\_\_\_



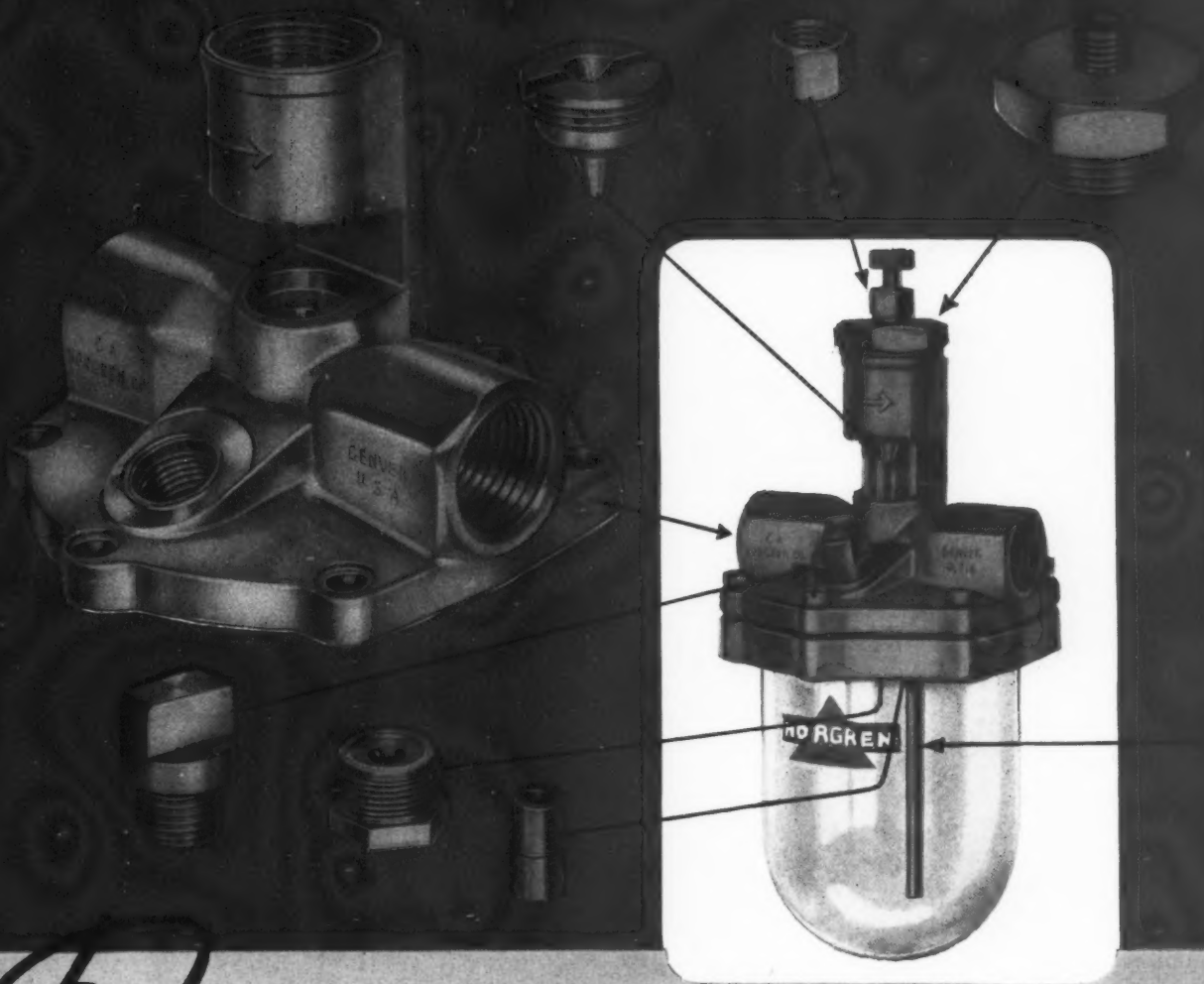
# DIAMOND

## MACHINE COMPANY

OF PHILADELPHIA

Subsidiary of American Engineering Company, builders of fine machinery for over 75 years, and  
manufacturers of Taylor Stokers, Marine Deck Auxiliaries, Lo-Hed Hoists, Heel-Shaw Fluid Power.





# *Doubling* IN BRASS

THE BANDMASTER who boasts of musicians that "double in brass" knows he has an added value—something extra to give his audience. Many manufacturers feel the same way about the use of Anaconda Hot Pressed Parts in their products.

Let's take, for example, the C. A. Norgren Co. of Denver, Colorado, manufacturers of the Norgren Air Line Lubricator illustrated above. This pneumatic tool lubricator is placed in the air line and is automatic in operation—"it starts when the tool starts—stops when the air flow stops."

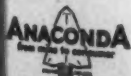
An Anaconda Hot Pressed Part was selected for the brass body for two reasons: First, this method of manufacture is ideally adaptable to its unusual design. Parts are uniform, more alike than peas in a pod. Clean, smooth surfaces, free of foundry sand, scale and dross, enhance its appearance, help to make machining easy, reduce scrap, increase tool life.

The second reason is even more important: These hot pressed parts have double the strength of ordinary sand castings, yet the total cost—per machined and tested piece—is little, if any, more. Being made of wrought metal, they are free from internal defects, are gas, air, oil and watertight . . . assurance of dependable, on-the-job performance.

The screw machine parts also illustrated above have a story of their own, as told by Mr. C. A. Norgren, General Manager:

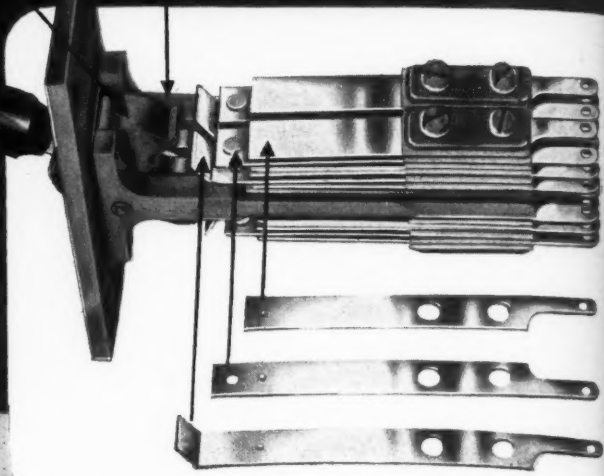
"For many years we have used The American Brass Company's free cutting brass rod and tubing. Those were trouble-free years as far as our screw machine operations were concerned. Then came the war with the material controls with which all of us are now familiar. We did what everyone else would have done under the circumstances—shopped the market from Boston to San Francisco. Instead of one source of supply, we found we were purchasing 'free cutting brass' from as many as eighteen different sources.

"Many trade names were lost in the shuffle and, much to our surprise, we found that all brass rod was not *good* brass rod. We found it necessary to give unusual consideration to screw machine jobs where formerly trouble-free operation was the rule. We looked forward with pleasure to the time when The American Brass Company could again fill all our orders without restrictions and we could rely on our vast records of tooling, speeds and feeds which have proved so economical in our screw machine operations."



## *Anaconda Copper & Copper Alloys*

Extruded and  
Drawn Shapes  
Simple  
Jobs like this



**S**IMPLIFICATION IS AN ECONOMIC NECESSITY on an assembly such as this multi-pole, double-throw key switch made by the Kellogg Switchboard & Supply Company of Chicago. Used throughout the telephone industry and by manufacturers of radio, electronic and control equipment, this key, illustrated above in actual size, is made up of more than a hundred component parts—67 of them metal, and most of them copper alloys—from the brass escutcheon to the nickel silver springs.

Simplicity, accuracy and economy go hand in hand in the production of the two most complicated parts of this key—the cam and the frame. These two intricately formed pieces are literally “sliced” off long mill lengths of Anaconda Extruded-and-Drawn Shapes.

The slot milled, ten holes drilled and four tapped, the frame is ready for assembly—providing adequate strength and rigidity, and accuracy of contour and dimensions. The cams are milled to close tolerances, drilled and tapped. Integral pins for the rollers are

shell milled—cam action is always smooth, no parts can work loose. Little wonder that similar Kellogg Keys, made of materials supplied by The American Brass Company, are still in service after twenty-five years of “24 hours a day, seven days a week” service on switchboards of some of the busiest exchanges.

Compare this method of producing complicated parts from readily machinable Anaconda Shapes with the costly processes involved by any other method—machining from bar stock or sand castings, stamped parts or built-up assemblies.

The American Brass Company produces copper, brass, bronze, nickel silver and special copper alloys in practically all commercial forms—sheets, strips, plates, wire, rod, tubes, special extruded, rolled and drawn shapes, hot pressed parts and pressure die castings. The manufacture of such a wide range of copper alloy products places us in a position to suggest “the one best metal to do the best possible job for a specific application.” Our Technical Department will be glad to work with you.

44118

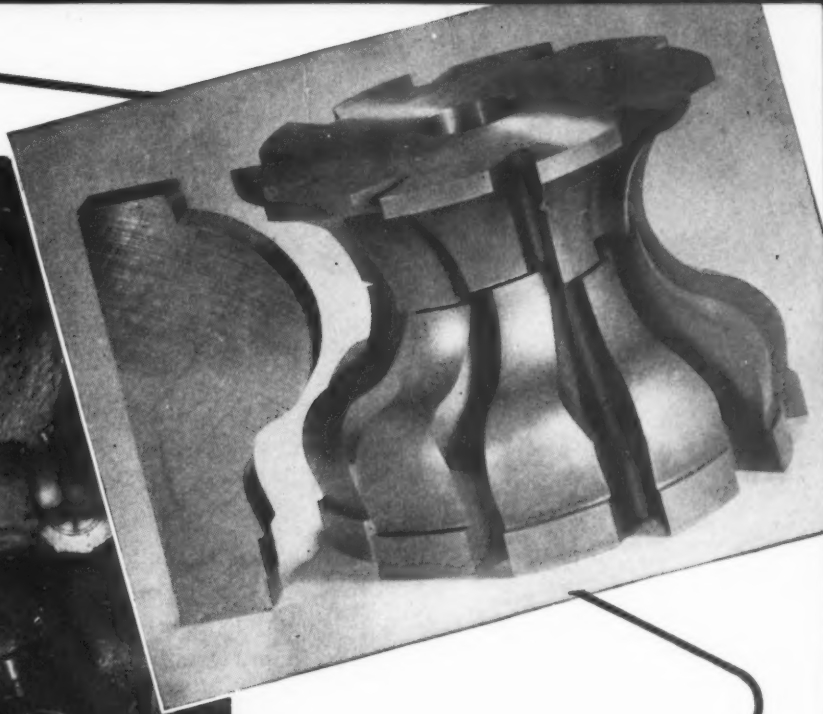
## THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ontario



*Anaconda Extruded & Drawn Shapes*



## EXPERIENCE... THE ESSENTIAL INGREDIENT IN FORM CUTTERS!

Every profile milling job has peculiar features, as different from plain milling as a curve is different from a straight line. The Illinois formula, furnishes the answer to the problem.

From their years of close cooperation with the leading working companies, Illinois has developed the advantages of a long experience in the design of metal cutting tools. For the most efficient and accurate metal cutting, Illinois has developed the use of form rollers, cutters, and other proven milling techniques.





Shaper Cutters



Ground Hobs



Milling Cutters



Broaches



Ground Form Tools

**ILLINOIS** PRECISION METAL CUTTING TOOLS

Fundamentally it is engineering ability which sets any manufacturing organization apart from its contemporaries.

Special Tools... Gear Measuring Machines...  
Gear Measuring Blocks... Die Filing Machines

# ILLINOIS TOOL WORKS

2501 N. KEELER AVE. CHICAGO 39, ILLINOIS  
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario



MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS



# SOUTH BEND LATHES

## GIVE SKILLED MANPOWER MORE PRODUCING POWER

To give our fighting forces the increased striking power of more and better weapons, Industry's skilled manpower must have the increased producing power of fast, accurate tools.

South Bend Lathes squarely meet this requirement. Their rigidity and wide range of spindle speeds permit taking full advantage of the higher cutting speeds that are possible with carbide and diamond tipped tools. Their precision makes it possible to finish turn and bore with such accuracy that subsequent grinding and honing operations can often be eliminated.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes—9" to 16" swings. The Turret Lathes are made in two sizes—Series 900 and Series 1000. Write for a catalog.

BUY  
WAR  
BONDS



16" SOUTH BEND  
TOOLROOM LATHE



**SOUTH BEND LATHE WORKS**  
SOUTH BEND 22, INDIANA • LATHE BUILDERS FOR 37 YEARS

ES  
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900 and



**STRAIGHT** type 6000 R.P.M. Air grinders with 6-inch wheels were the rule in this foundry. Then came a lot of small castings with hard-to-get-at spots to be cleaned. Production wasn't anything to write home about. So they called in the Rotor Application Engineer for a bull's-eye analysis.

"It's an Air tool job," said the R. A. E., "but you need a cone wheel to get at those corners quicker... and you need 8500 R. P. M. tools to take full advantage of cone wheel cutting action." The change was made to 8500 R. P. M.

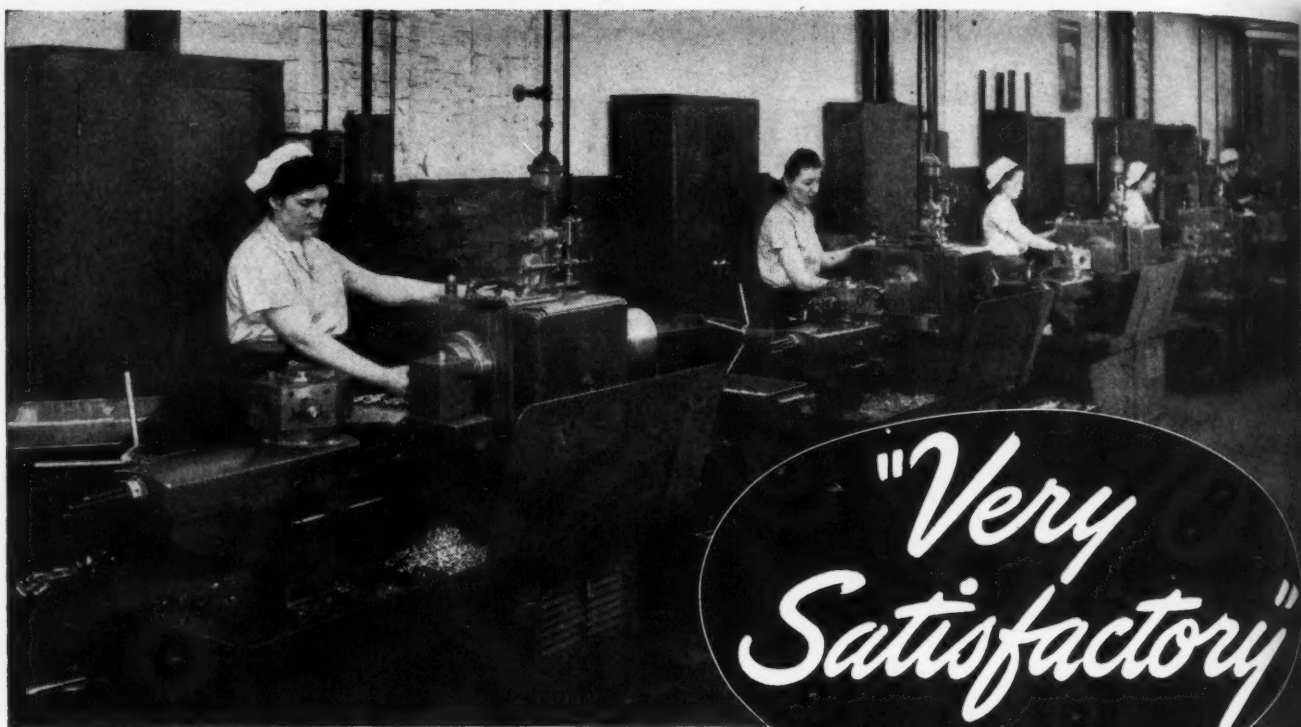
Rotor Air cone type grinders with these results:

1. 25% more output per tool.
2. Less operator fatigue.
3. 25% longer wheel life.

Our diary is full of similar cases where we've steered shops to the *right tool*—either Air or High-Cycle—and given the boys at the wheel something to write home about in the way of increased war production. We'd be glad to analyze your problems.

Yours for the *right tool*,  
**AIR O'TOOL**





*"Very Satisfactory"*

#### MEMO

Complete information about Oster "RAPIDUCTION" Lathes will be furnished promptly but no definite commitments on delivery dates can be made under existing conditions. The Oster dealer in your locality will advise you of the current status of delivery schedules at any time.

A critical shortage of highly skilled operators was faced by a manufacturer with large contracts for aviation valve stems and guides and other contracts for 20 mm. projectiles.

The "manpower shortage" was overcome by installing a battery of Oster "RAPIDUCTION" Lathes whose SIMPLIFIED construction and operation made possible rapid training of women with little or no prior experience as machine operators.

Results were stated by the owner of those Oster "RAPIDUCTION" Lathes to be "Very Satisfactory."



Wartime performance of Oster "RAPIDUCTION" Lathes forecasts a peacetime demand for Oster-engineered equipment designed for fast, accurate machining at low cost.

# "Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY, 2073 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



# "UNION"

*- the  
Tools you  
buy again*

-for Accuracy that lasts on tough wartime jobs—for uniformly precise results—for continuous, uninterrupted production. Each Union Tool is guaranteed to do its part for the war effort by delivering the greatest possible efficiency and output between grinds. Demand the ultimate for Accuracy... demand Union!

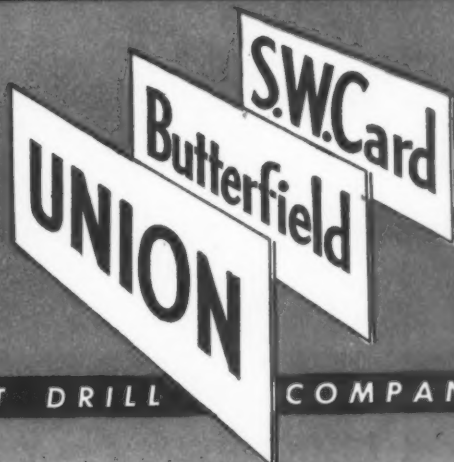
*Union Twist Drill Co.*  
*Athol, Mass.*

S. W. Card Mfg. Co. Div., Mansfield, Mass.  
Butterfield Div., Derby Line, Vt.  
Butterfield Div., Rock Island, Quebec.

#### STORES

New York: 61 Reade St.  
Chicago: 11 So. Clinton St.  
Detroit: 5527 Woodward Ave.

San Francisco: 121 Second St.  
Los Angeles: 524 E. Fourth St.  
Seattle: 568 First Ave., South.



DIVISIONS OF THE UNION TWIST DRILL COMPANY

Now—more than ever—Specify

# "BUTTERFIELDS"

As American production swings the tide towards Victory, Butterfield Taps and Reamers are demonstrating their accuracy and stamina on some of the toughest jobs ever encountered in metal-working. Now, when machines are being called upon for day and night operation, it is more important than ever to equip them with tools

of proven ability. For the high standards of accuracy demanded in munitions production, and for the high output necessary to win this war of production—specify Butterfields!



*Butterfield Division*

*Derby Line, Vt.*

*Rock Island, Ill.*

STORES: New York, 61 Reade St.—Chicago, 11 So. Clinton St.—Cleveland, Hal. W. Reynolds, 3346 Superior Ave.—Detroit, 5527 Woodward Ave.—Los Angeles, 524 E. Fourth St.—Toronto, 137 Wellington St., West.—Montreal, 111 St. Paul St., West.—Winnipeg, 403 Travellers Bldg.—Vancouver, 307 Shelly Bldg. Agents for Great Britain: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

D I V I S I O N S   O F   T H E   U N I O N

THE in-built accuracy, efficiency and stamina that have made the Card name an emblem of tap quality for many years is being applied today to thousands of war production jobs and is helping many a busy war plant improve tapping performance on work that must meet increasingly strict precision standards. We will be glad to analyze your threading problems and recommend the best procedure and the proper tap for every job. For efficient wartime service—



*S. W. Card Mfg. Co.*  
Mansfield, Mass.

STORES

New York: 61 Reade St.	San Francisco: 121 Second St.
Chicago: 11 So. Clinton St.	Los Angeles: 524 E. Fourth St.
Detroit: 5527 Woodward Ave.	Seattle: 568 First Ave., South



T W I S T   D R I L L   C O M P A N Y



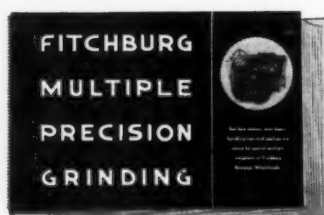
# WHAT ABOUT TOMORROW'S GRINDING COSTS?

You can cut tomorrow's costs with the Fitchburg Grinders you buy today.

Fitchburg low cost method of mounting standard Bowgage Head Grinding Wheel Units for special single applications, or to multiple grind special jobs, will give you faster wartime production at lower cost, and leave you in a position to make rapid changeovers when the present emergency is over.

All Fitchburg Bowgage Head Automatic Precision Grinding Wheel Units are standard. They can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

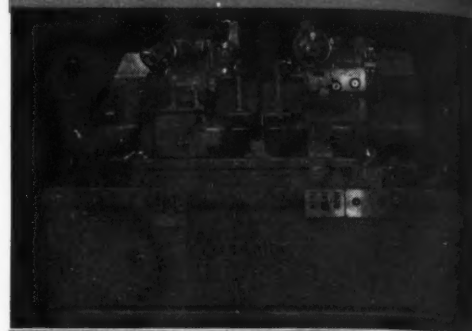
Save time and money — speed up cylindrical production grinding with Fitchburg Bowgage Heads.



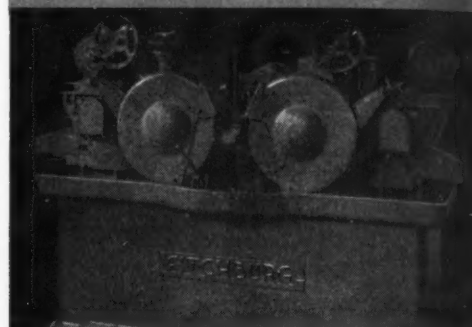
*This Book shows how to cut grinding costs. . . . Free to executives. . . . Write for it today.*



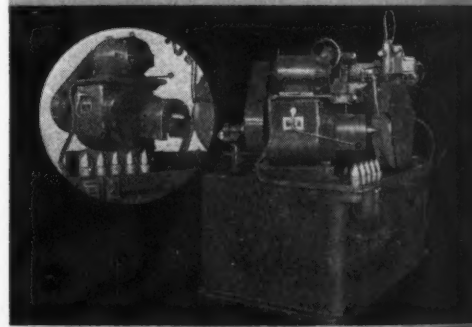
TRIPLE HEAD MACHINE



DOUBLE HEAD MACHINE



GEAR SHIFT GROOVE GRINDER



OLIVE GRINDER

**FITCHBURG** GRINDING MACHINE CORP.  
FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

SAVE WITH AUTOMATIC MULTIPLE PRECISION GRINDING

# New Facts

## ON CHUCKING MACHINE WORK

HOW COSTS WERE CUT ON

25

CHUCKING MACHINE JOBS



MULTIPLE SPINDLE CHUCKING AUTOMATICS

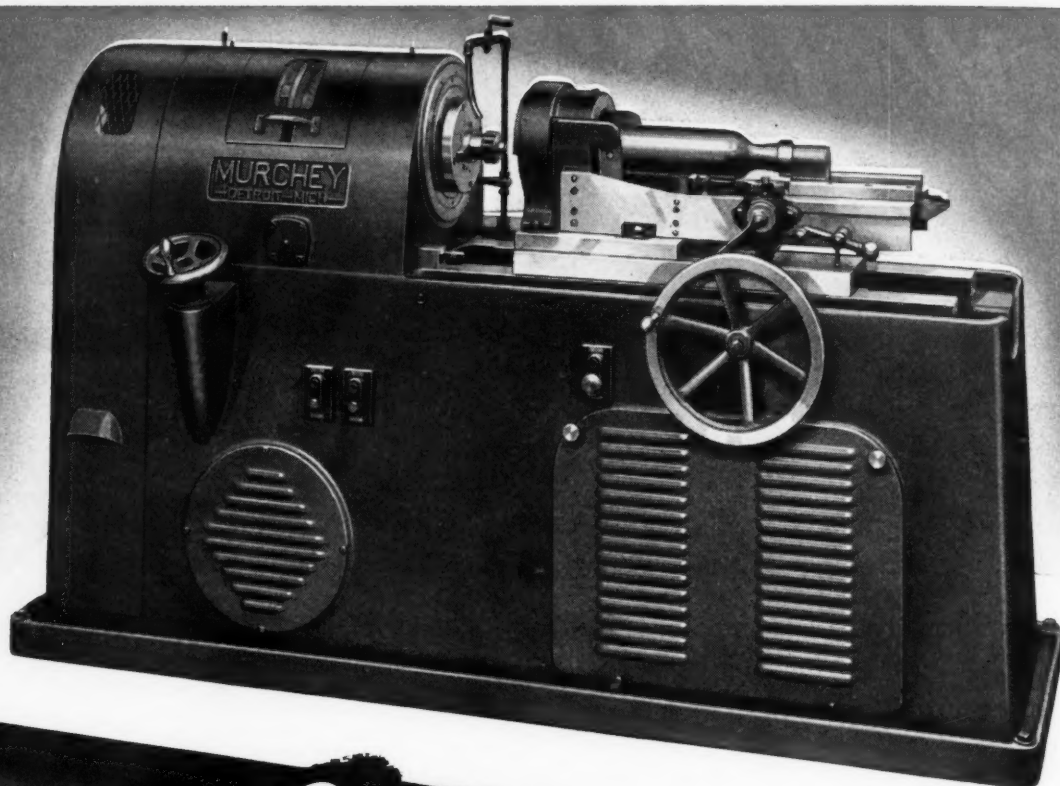
This new booklet brings you important details on 25 examples of chucking work—covering a wide range—in which unusual time and money savings have been made.

Your personal copy will be sent if requested on your company letterhead.

THE **NATIONAL ACME** CO.

170 EAST 131<sup>ST</sup> STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING



**FOR  
FASTER,  
MORE ACCURATE  
THREADING**

that will keep  
YOU AHEAD  
of schedules—

Install a

**MURCHEY**

**No. 32 THREAD MILLING MACHINE**

Built and geared for mass production of right or left hand internal or external threads 1" in diameter up to 4" O.D. inclusive and up to 6" I.D. depending on the contour of the piece. 3" long up to 1/2" pitch and covering full length of thread through annular milling cutters. Completely hydraulic work cycle and a variable speed drive permits the selection

of the right speed and feed for each job. Write for complete catalogue to Dept. M.

**MURCHEY MACHINE & TOOL CO.**  
DETROIT 26, MICHIGAN

*Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Shell Tapping Machines. Write for literature on any or all of these products.*

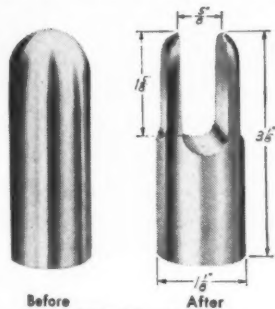
**MURCHEY**





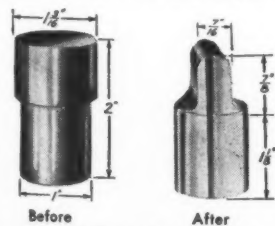
(Model 10-E)  
Pat. Applied for

**Milling of 10 parts  
simultaneously increases  
production 100-500%**



Before  
**ALUMINUM PARTS**

These aluminum parts were milled upon the AERCO Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before  
**CHROME STEEL PARTS**

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the AERCO Multi-Grip Chuck. Individual milling time was 15 per hour.

## AERCO HYDRAULIC MULTI-GRIP CHUCK

*check the operational features back of this record:*

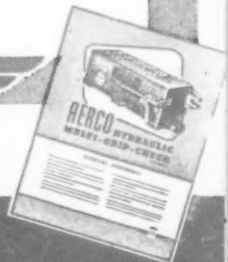
- 1. A single loading for 10 parts:** new multi-grip chuck saves starting, stopping, cleaning fixture each time as with single-station units.
- 2. No sacrifice of accuracy:** self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations.
- 3. Pressure built quickly:** hydraulic hand pump lever builds pressure up to 2500 p.s.i. with a few strokes.
- 4. Quick re-loading:** self-opening collets are quickly re-loaded; adjustable depth stop for each collet eliminates necessity for gauges.
- 5. Safe operation:** work is held rigidly in collets and cannot turn or be pulled out during milling operation. Safety stop prevents damage to collets should all stations not be filled.
- 6. No waste milling motion:** Parts are held to minimum center distance eliminating cutting air—plus advantage of two rows which again doubles increased production.
- 7. Variety of collet capacity:** #10-B chuck has round collet capacity from  $\frac{1}{8}$ " to  $\frac{1}{2}$ " inclusive. #10-E chuck has round collet capacity from  $\frac{1}{2}$ " to  $1\frac{1}{4}$ " inclusive. Square and hexagon collets available for both chucks.

**Representatives Wanted in Principal Cities**

MANUFACTURED EXCLUSIVELY BY

**AERCO**  
CORP.

**HOLLYDALE, CALIFORNIA**



**WRITE FOR NEW FOLDER**

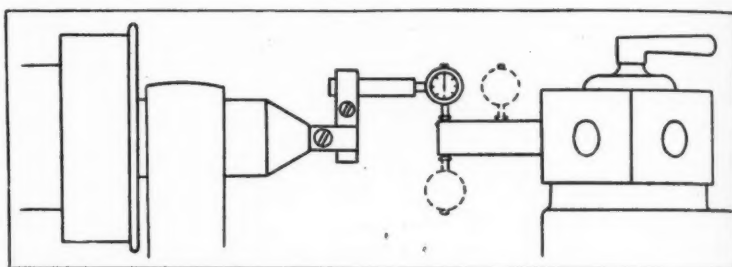
**KINKS**  
FROM GEOMETRIC

**ON HOW TO SAVE PRECIOUS CHASERS**

**...AND GET BETTER THREADING!**

**don't** risk getting imperfect threads or breaking precious high speed steel chasers by allowing machine to get out of alignment.

**do** keep tools and machine in good condition and check alignment occasionally by use of an indicator. ★



★ Misalignment of machine, caused by worn bed ways, turret slides or turret holes, throws an unequal burden on the Die Head, which must result either in imperfect threads or in chaser breakage, or both! Be sure that (1) turret lines up with work spindle, (2) Die Head shank is not battered, bent, or out-of-round. Most accurate **method of checking alignment** is shown above. Mount an indicator in the spindle, insert a plug in the turret hole, the plug projecting about 6". Errors in concentricity can be noted by bringing indicator in contact with test bar and rotating spindle. Errors in parallelism between spindle and bar can be noted by setting indicator to contact top of bar and feeding turret forward and backward. Keep machines and tools in good order — you'll get better threads, conserve vital war tools! **THE GEOMETRIC TOOL CO., NEW HAVEN 15, CONNECTICUT.**

ANOTHER GOOD KINK



The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employees contribute at least 10% of their earnings, through the Payroll Savings Plan, for War Bonds. Buy War Bonds and Stamps — make your dollars fight!



**GEOMETRIC**

SELF-OPENING DIE HEADS  
COLLAPSING TAPS  
CHASER GRINDING MACHINES

SOLID ADJUSTABLE DIE HEADS  
SOLID ADJUSTABLE TAPS  
THREADING MACHINES



*Would you go to a Butcher to have a tooth Pulled?*

What! Let a butcher yank a tooth? Not by a long shot! Naturally, you'd make a quick bee-line for the nearest dentist.

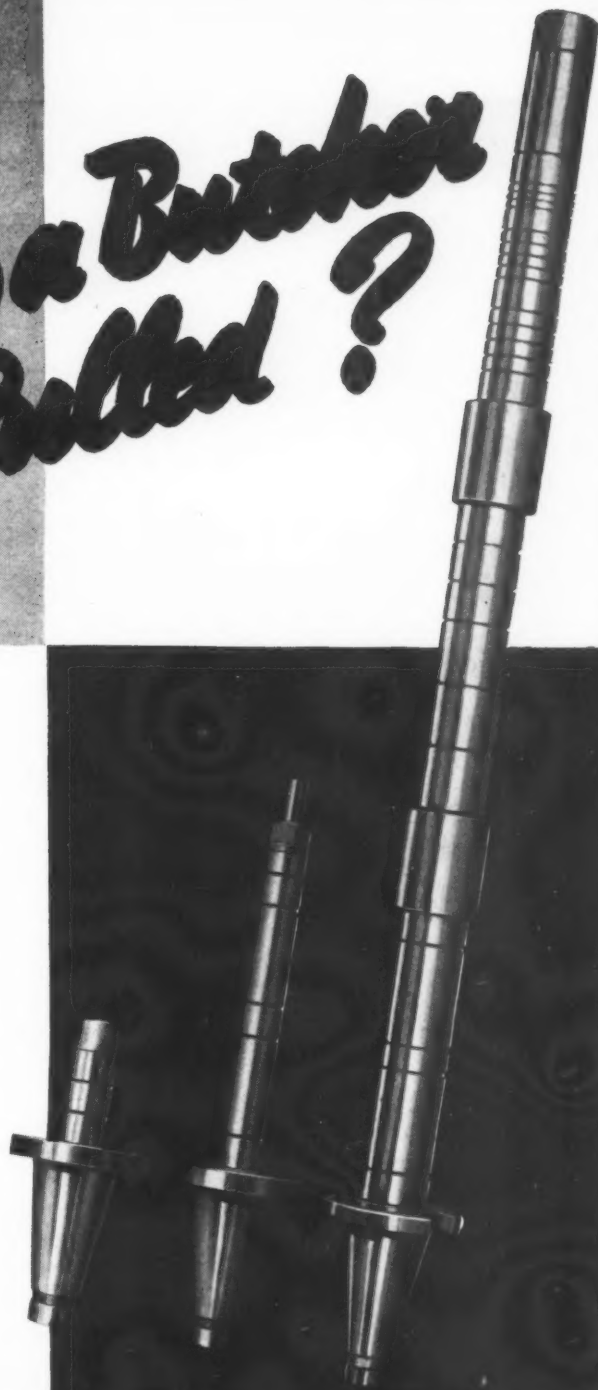
It's just as natural to go to a milling machine specialist when in need of arbors and accessories. Kempsmith has specialized in the design and manufacture of milling machine equipment for more than a half-century. This wealth of technical experience is built into all Kempsmith Arbors and Accessories.

Available in all popular sizes and types, and adaptable to any make of milling machine with standardized spindle, Kempsmith Arbors and Accessories are regularly carried in stock for immediate shipment.

Mail coupon below for new Kempsmith Arbor Bulletin.

*Buy Your Arbors from an Arbor Specialist*

**KEMPSMITH**

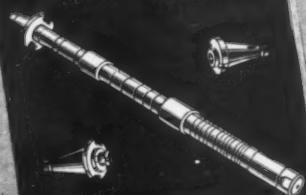


*Precision Built Milling Machines Since 1888*

*Get Your Copy of this  
NEW ARBOR BULLETIN*

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.

**ARBORS**



*by* **KEMPSMITH**

**THE KEMPSMITH MACHINE CO.**

1821 South 71st Street, Milwaukee 14, Wis., U. S. A.

YES, I'm anxious to get the right type of arbor for my milling machine. Send me copy of your Arbor Bulletin No. 116.

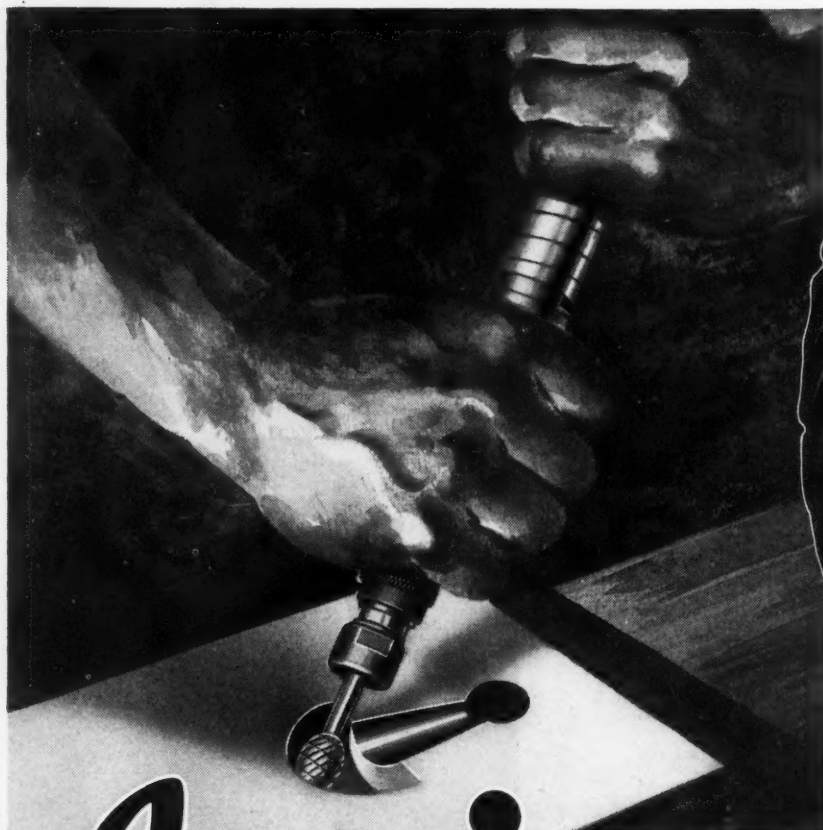
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# *Jarvis* **POWER TOOLS** and **GROUND FROM THE SOLID ROTARY FILES**

The perfect combination for fast and economical filing, grinding, polishing, buffing, cleaning, and sanding operations. Jarvis Rotary Files are available in a wide range of styles and sizes to meet the requirements of the metal craftsman.

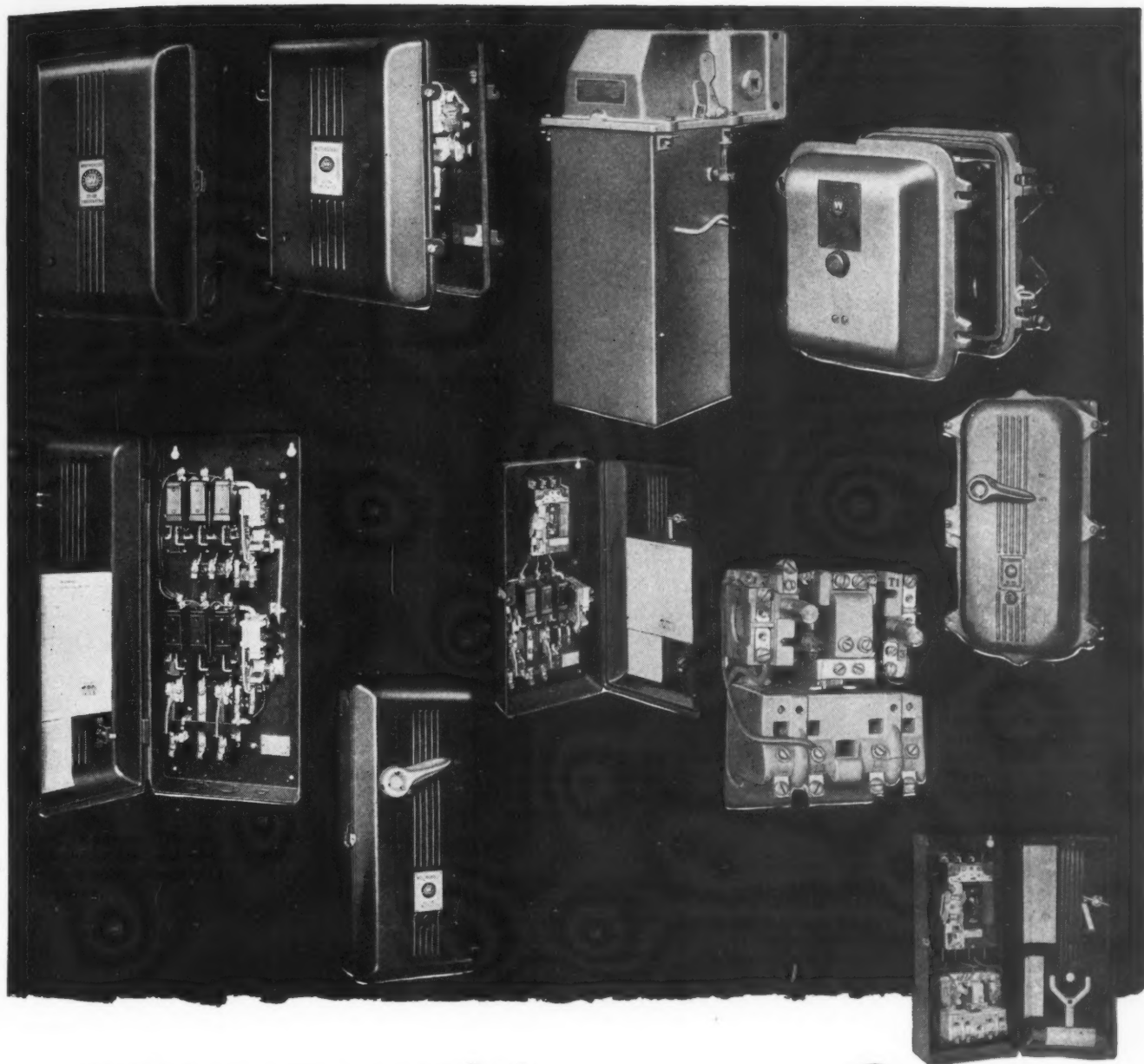
**Jarvis "Hy-speed" Rotary Files:** The recognized standard in thousands of manufacturing and machine tool plants. Furnished with Jarvis Hy-speed Case, increasing the life of the tool three times or better under average conditions.

**Jarvis "Tungsten Carbide" Rotary Files:** The hardest, fastest Rotary File ever put into a flexible shaft machine! When the original cost of these tungsten carbide tools is spread over extremely long-life operation and subsequent regrindings, your rotary file costs drop to a fraction of those incurred with the use of ordinary high speed steel files.

*Send For Our Recent Catalogs*

Furnished with  
Jarvis Hy-speed Case  
or Tungsten Carbide

**THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.**  
TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES  
QUICK CHANGE CHUCKS AND COLLETS



## WHEN YOU NEED *Magnetic Controls*

**FOR SINGLE-PHASE AND SQUIRREL-CAGE MOTORS CONSULT  
WESTINGHOUSE BUYING DATA (NEW CATALOG 7000)**

With the new Westinghouse Buying Data, you can select and purchase the proper motor control in half the time.

Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any published previously by any manufacturer.

Chances are—if you are a buyer of motors and controls—that you have already received a copy of this new Catalog 7000 by mail. However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office. (Requests will be filled through district offices only — no mailing from Westinghouse headquarters at East Pittsburgh.)

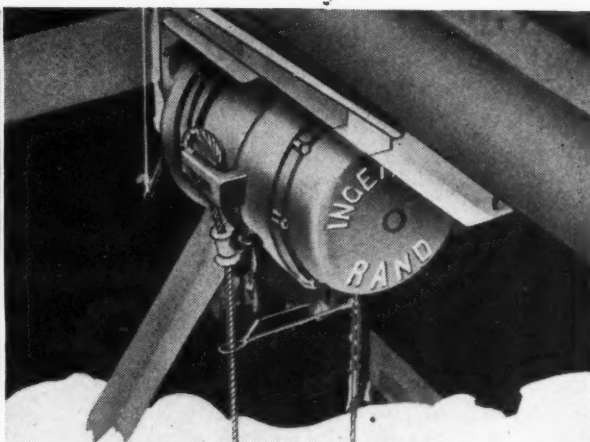
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**Westinghouse**  
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



*De-ion Linestarters*

MACHINERY, August, 1944—59



## ...THE END OF THE LINE

When our enemies look frantically aloft at the screaming Douglas Dive Bombers descending upon them with a lethal load of destruction, they know it is the end of the line for them.

Back in sunny California at the El Segundo plant, these newly assembled Douglas SBD's are pulled to the end of the line by a compact, powerful, air-motor hoist. Then another I-R air-powered hoist with a capacity of 10,000 pounds lifts the plane from its dolly car.

These are but two of many applications of compressed air and air-operated machinery that help speed the planes to our men on the war fronts.

Ingersoll-Rand Industrial Air Motor Hoists are built in twelve sizes with capacities ranging from 300 to 20,000 pounds. They feature—automatic brake—graduated reversing valve—positive lubrication and automatic up-and-down stop for safety.

Our Engineers are available to help you make a selection.



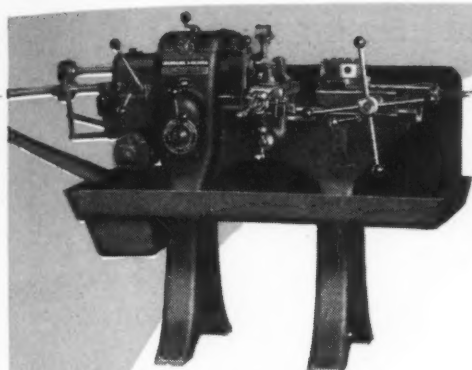
# Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

8-456







No. 1 Geared Electric Turret Lathe  
5/8" x 5" Turning Capacity

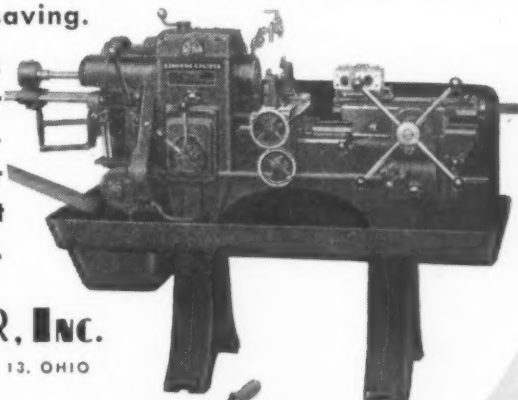
# *Production is Speeded Up* BY ELECTRIC FEEDING AND CHUCKING OF BAR

A gentle pressure on a trigger lever is sufficient to start the automatic cycle. The actual work of feeding out and gripping the bar is done electrically through a cam operated mechanism in less than one second. The day's output is thus increased while conserving the energy of the operator.

Second operation and light chucking work can be handled equally well by the electric collet chuck.

For certain kinds of work the in and out movements of the cross slide can be used to control the feeding of the bar, and the gripping of the work, thus effecting additional time saving.

Bardons & Oliver Geared Electric Turret Lathes have many other outstanding time and labor saving features. So write us for the complete story of what these machines will do for you.



No. 2 Geared Electric Turret Lathe  
1" x 7" Turning Capacity

## **BARDONS & OLIVER, INC.**

1133 WEST 9TH STREET

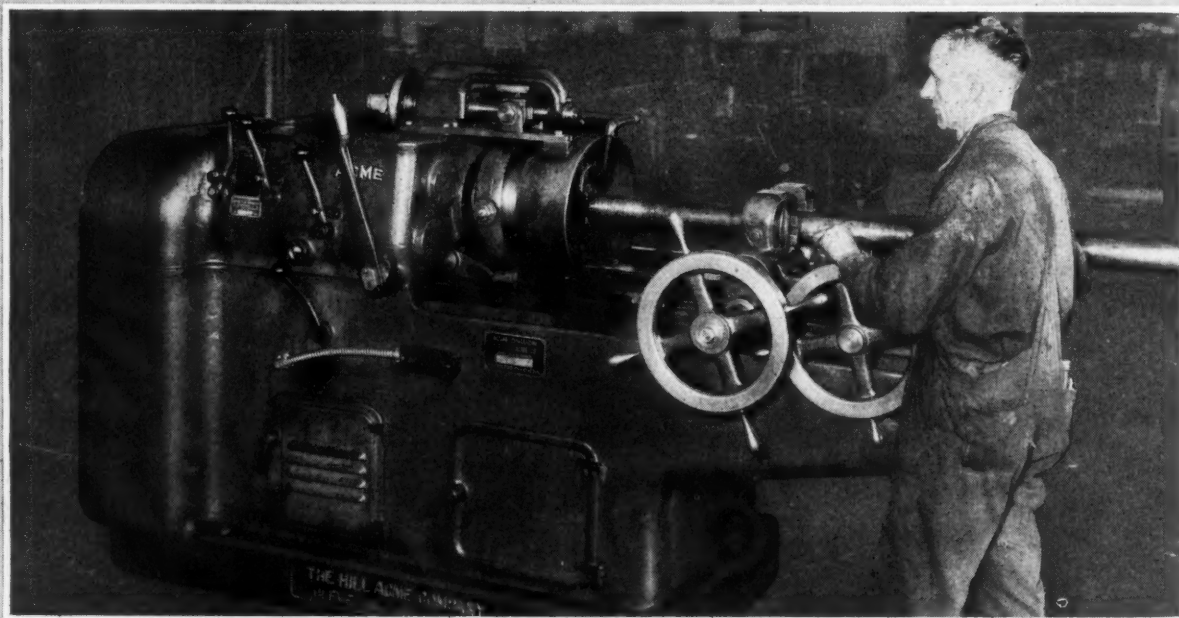
CLEVELAND 13, OHIO



# *Threading 3 inch solid bar*

## **ACME XL Threading Machines**

coupled with the ACME Tangent Die Head thread 3 inch solid bar 20 feet long with a U. S. Standard  $3\frac{1}{2}$  pitch thread. In operations such as this the ACME Micrometer Adjustment of the die head maintains the accuracy of the finish cut diameter and insures greater production. . . . An exclusive ACME feature of this micrometer adjustment permits the accurate setting of cutting diameter while head is rotating. This adjustment is standard equipment on all ACME XL Threading Machines.



**THE HILL ACME COMPANY**

ACME MACHINERY DIVISION

Established 1882

FORGING • THREADING • TAPPING • BOLT • NUT • RIVET MACHINES

4535 ST. CLAIR AVENUE

*Cleveland 14, Ohio*

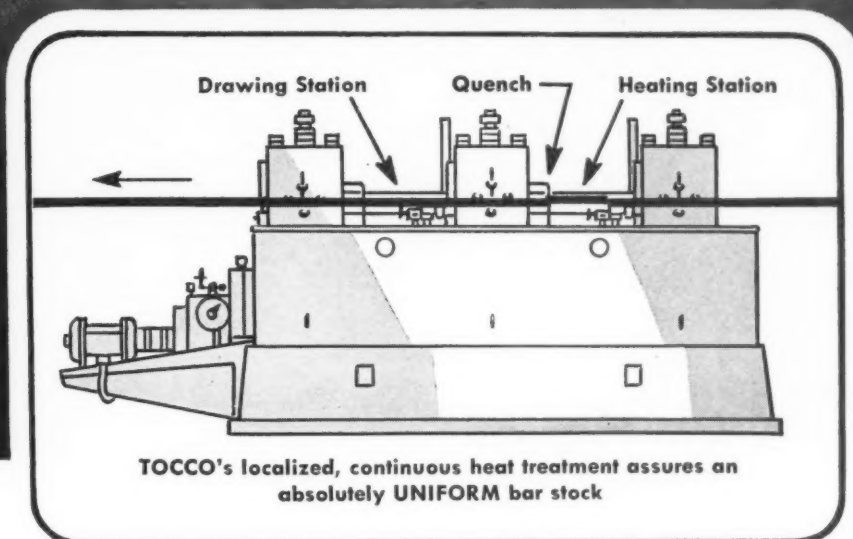


# CUT COSTS 50%

## IN HEAT-TREATMENT OF BAR STOCK

Conventional—\$30 per ton

Tocco Process—\$15 per ton



**S**TANDARD steel bar stock enters the TOCCO machine shown above, is heated, quenched and drawn continuously as it passes through. It emerges as a *straight, scale-free* heat-treated bar with an absolutely *uniform* metallurgical structure throughout its entire length and cross-section (for maximum machining speed). All this at half the cost of the conventional method.

As many as eight TOCCO Bar Stock Units can be operated by one man, producing any desired tonnage of heat-treated stock in sizes of  $\frac{3}{8}$ " to 3" diameter—any length.

Typical performance is for one man to treat 1 ton of 1-inch, S.A.E. 1045 stock per hour—hardened to 63-64 R.C. and drawn to 30-31 R.C. as shown above. Comparison of results:

### CONVENTIONAL METHOD

Costs \$30 per ton  
Heavy scale  
Bar is distorted  
Hot, dirty conditions  
Non-uniform structure

### TOCCO PROCESS

Costs \$15 per ton, total  
Scale-free  
Bar is straight  
Cool, clean  
Uniform throughout

TOCCO Engineers will gladly explain this machine further and study its application to your particular problems. Bulletin No. 14 free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

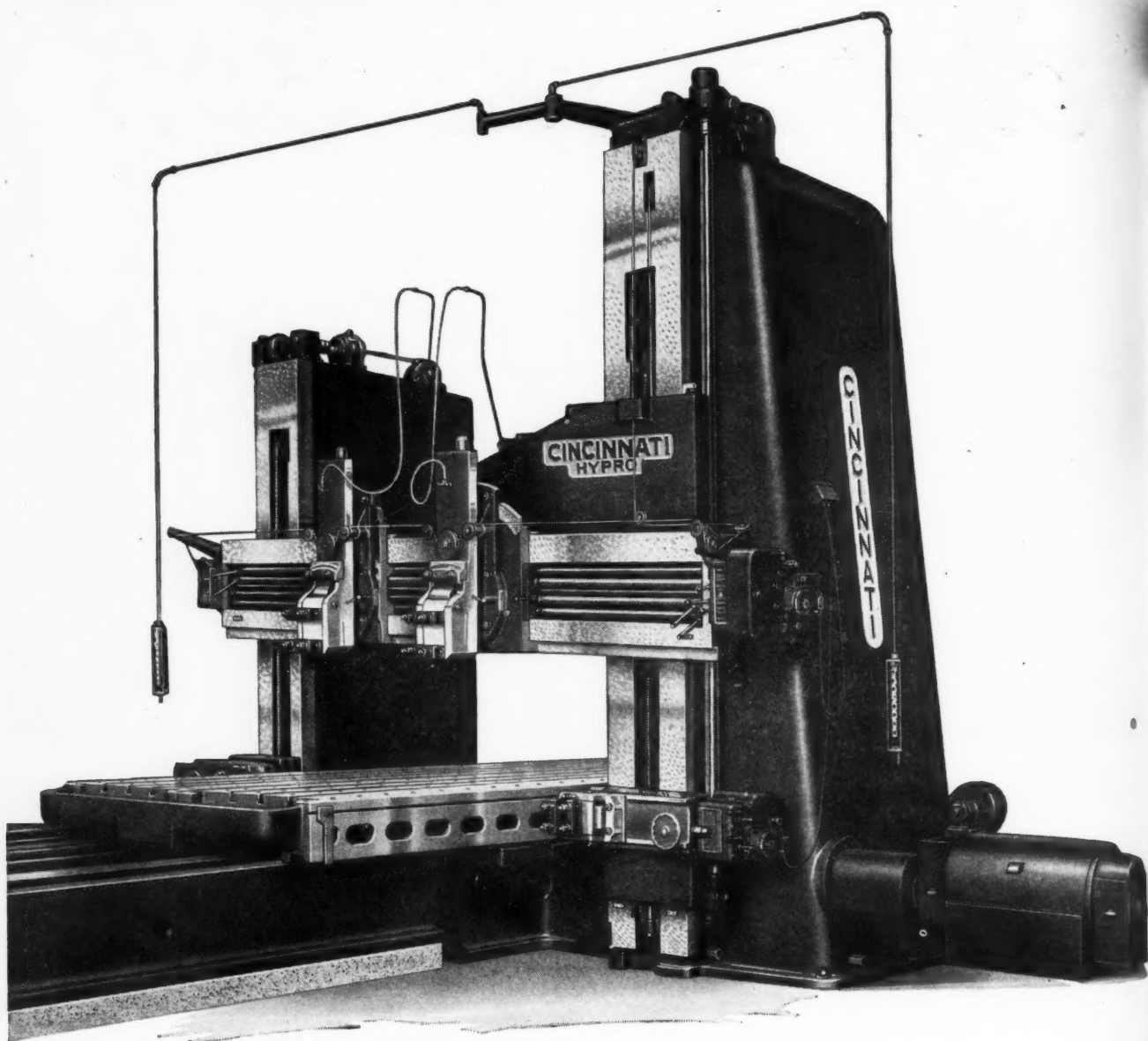


# TOCCO

HARDENING..BRAZING  
ANNEALING..HEATING







## Cincinnati Hypro Planers Produce Ship Parts For Invasion

● Cincinnati Hypro Planers with convertible housings like the 132" x 96" x 40' Hypro shown above are being used in many American shipyards to machine large metal parts swiftly and economically.

The planer above is equipped with special mechanism for scarfing armor plate.

The convertible column with side head attached provides for the use of four heads similar to a double housing planer. When the left hand column is removed the openside planer can handle many shapes and sizes not possible on the conventional double housing planer.

*Write for Bulletin 110M illustrating Hypro Openside Planers.*



**THE CINCINNATI PLANER COMPANY**  
 PLANERS ... VERTICAL BORING MILLS ... PLANER TYPE MILLERS  
 CINCINNATI, OHIO, U.S.A.

## MACHINE-TOOL TIPS FROM THE TOP-NOTCHERS



### "There's more to Tapping than just cutting a thread"

says W. J. EBERLEIN, General Sales Manager,  
GREENFIELD TAP & DIE CORPORATION, Greenfield, Massachusetts

Because users of taps are interested primarily in the screw threads produced, there is a tendency to disregard the fact that a tap is a precision tool. To insure perfect screw threads, care in tap selection and in proper conditions of use are of paramount importance.

**O**F UTMOST IMPORTANCE is the fitting of the tap to the drilled hole in relation to the thread desired. The size of a drilled hole, prior to tapping, should be large enough to produce a thread depth of about 75%. (See formulae below.) In tapping a 100% thread depth, approximately 3 times more power is needed than when tapping a 75% thread, plus increase in tap breakage; yet the 100% thread is only about 5% stronger.

#### Formula for obtaining tap drill size:

Outside Diameter  $\times$  .0130  $\times$  % full thread = Drill size  
Diameter  $\div$  number threads per inch

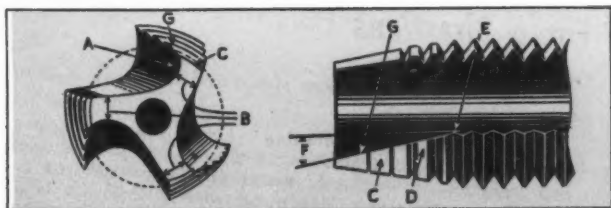
Example for  $\frac{1}{4}$ "-20 thread:  $.250 - \frac{.0130 \times 75}{20} = .2013$  or number 7 drill

#### Formula for obtaining percentage of thread a given drill will produce:

(Outside Diameter - Drill Size)  $\times$  number threads per inch = % of full thread  
.0130

Example for  $\frac{1}{4}$ "-20 thread:  $\frac{(.250 - .201) \times 20}{.0130} = 75.4\%$  Thread

"In the type of precision work being turned out today there is no place for dull, inaccurate taps. Trying to make a tap cut 'just one more thread' in order to 'speed' production often results in broken taps, rough threads, oversize cuts. These pitfalls can be avoided by sharpening at the first sign of dullness and, on production jobs, sharpening every so many holes.



"In sharpening a 'gun' tap always use a new one as a guide. Dress abrasive wheel to fit flute, maintaining exactly form of 'hook' (G) above. When ends of lands (B) become thin from continued regrinding, grind end of tap straight back until lands again reach normal thickness. Using new 'gun' tap as guide, carefully reform 'hook' at (G), at same time maintaining a straight cutting edge (A) and pronounced angle (F). In re-grinding chamfer (C) be sure to grind the relief, leaving cutting edge (A) the highest edge—gradually backing away towards heel, shown by circle at (C) in cut at the left above. Maintain angle (F) for shear cut. Remove only enough metal to keep the cutting edges sharp, at same time retaining the original form of flutes.

#### SUGGESTED TAPPING SPEEDS AND LUBRICANTS

Material Being Tapped	Speed in Feet per minute			Suggested Lubricant
	Carbon Taps	Regular High Speed Taps	"Hawthorn" High Speed Taps	
Aluminum Metal	•	15-25	20-30	Active Sulfurized Cutting Oil
Aluminum	45-60	90-100	100-110	Sulfurized Cutting Oil
Babbitt	•	60-70	70-80	Dry
Brass	45-60	90-100	100-110	Inactive Sulfurized Cutting Oil
Brass	20-30	40-60	60-70	Inactive Sulfurized Cutting Oil
Brass-Manganese	•	30-45	35-50	Inactive Sulfurized Cutting Oil
Copper	45-60	90-100	100-110	Inactive Sulfurized Cutting Oil
Die Castings—				
Aluminum	20-35	40-70	70-80	Sulfurized Cutting Oil
Zinc	20-35	40-70	70-80	Water Soluble Oils
Duralumin	45-60	90-100	100-110	Sulfurized Cutting Oil
Fiber	•	80-90	90-100	Dry
Iron—				
Cast	•	70-90	80-90	Dry or Water Soluble Oil
Malleable	•	35-40	45-70	Water Soluble Oil <sup>1</sup>
Metal Metal	•	20-25	25-30	Active Sulfurized Cutting Oil
Nickel Silver	•	75-85	85-95	Active Sulfurized Cutting Oil
Rubber (Hard)	•	80-90	90-100	Dry
Steel—				
Cast	•	20-30	25-35	Active Sulfurized Cutting Oil
Chromium	•	20-30	25-35	Active Sulfurized Cutting Oil
Machinery	20-30	40-60	60-70	Active Sulfurized Cutting Oil
Manganese	•	10-15	15-20	Active Sulfurized Cutting Oil
Molybdenum	•	20-30	25-35	Active Sulfurized Cutting Oil
Nickel	•	25-35	30-40	Active Sulfurized Cutting Oil
Stainless	•	15-25	20-30	Active Sulfurized Cutting Oil
Tool	15-20	25-35	30-40	Active Sulfurized Cutting Oil
Tungsten	•	20-30	25-35	Active Sulfurized Cutting Oil
Vanadium	•	25-35	30-40	Active Sulfurized Cutting Oil

<sup>1</sup>Carbon steel taps are not recommended for these materials

"The importance of proper tapping speeds, and the use of the proper lubricant, cannot be stressed too strongly. For there is no one speed or lubricant that will produce efficient, economical tapping results under all conditions.

"The chart above will give you some idea of the wide variety of speeds and lubricants which may be used in tapping operations. (Consult a reliable cutting oil supplier for more specific data.)"

\* \* \*

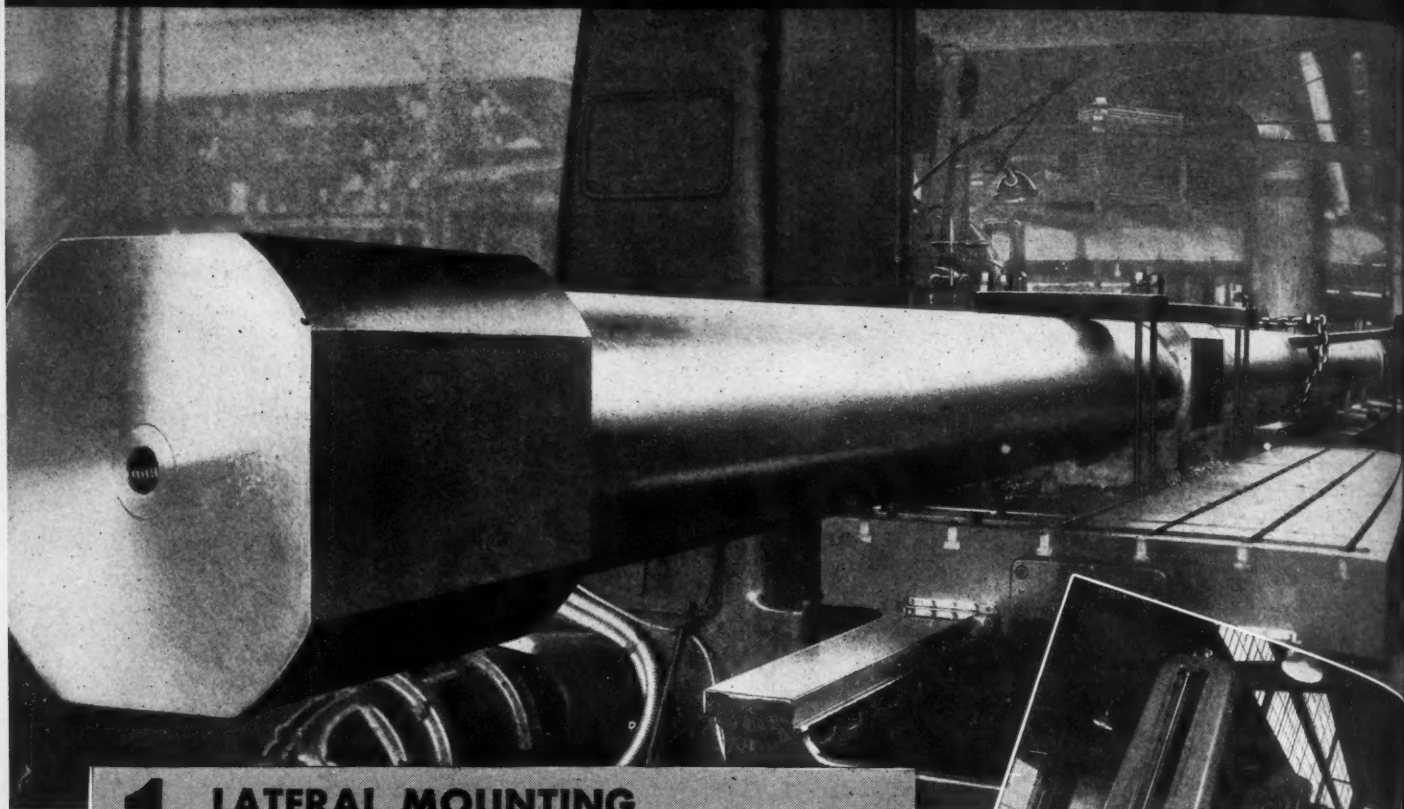
Longer tap life, increased production, better size control, smoother and more accurate threads, and the more efficient removal of chips are but a few of the results traceable to the application of the proper cutting fluids. It is because of this importance of the selection of the proper cutting oils that Shell Lubrication Engineers have developed a control technique that "balances" the oil to fit the machine, the application, and the tool. Ask the Shell man for the details.

**SHELL CUTTING OILS**  
FOR METAL CUTTING AND GRINDING



TAPS

# HOW TO HANDLE LONG



## 1 LATERAL MOUNTING

Milling the squares on a long shaft mounted at right angles to the machine spindle.

### Open Construction of Horizontal Boring Machine Permits Unhampered Extension of Work in Three Directions

At times you may be confronted with machining unusually long or large workpieces. The open type construction of the horizontal boring machine permits the handling of this type of work. It is possible to set up unwieldy shafts or parts with extensions in any plane—vertical—longitudinal—lateral. Once the workpiece is mounted on the table, actual machining operations are quite simple.

**No. 1—Lateral Mounting**—Here is an example of how the squares of an exceptionally long shaft were machined. When milling the center square, the shaft balanced on the table. When machining the end squares, the shaft rested with one end on the table, and the other on a roller support, giving the table freedom to travel crosswise for milling.

**No. 2—Vertical Mounting**—There are no overhead obstructions on a horizontal boring machine to interfere with workpieces. After setting up the connecting rod shown, boring and

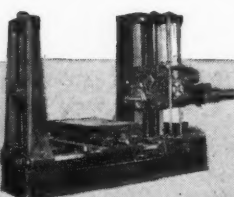
threading operations were simplified by using a continuous feed facing head.

**No. 3—Longitudinal Mounting**—Here is an example of how the flanges of a long shaft were machined. After removing the end support, it was only necessary to provide an auxiliary support for the shaft, equipped with rollers, to relieve the table and clamps of excessive strain. Free cross travel of the table, and vertical travel of the headstock permits drilling and reaming of all flange holes without trouble. Turning and facing of the flange, concentric with the shaft, can also be performed in the same setup, with our continuous feed facing head.

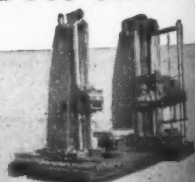
It would be impractical to mount and machine such work on any other type of equipment. Probably you have been confronted with similar problems. Experienced G. & L. engineers will be glad to help you solve your machining problems without obligation.



Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.



**GIDDINGS & LEWIS**  
140 DOTY STREET



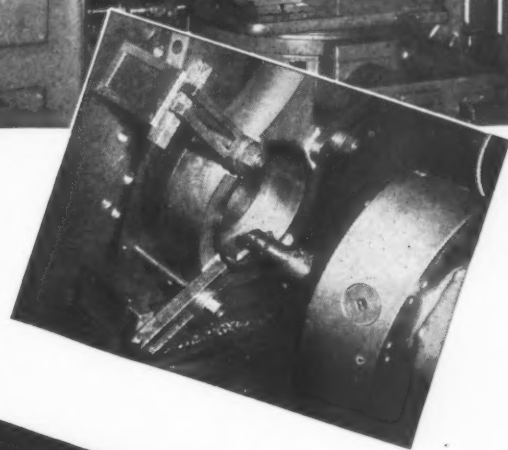
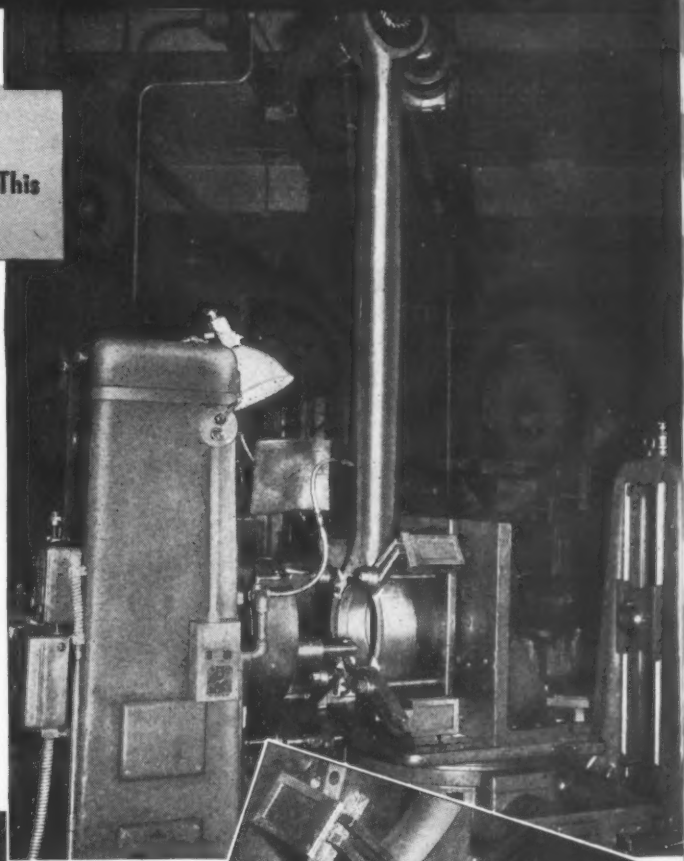
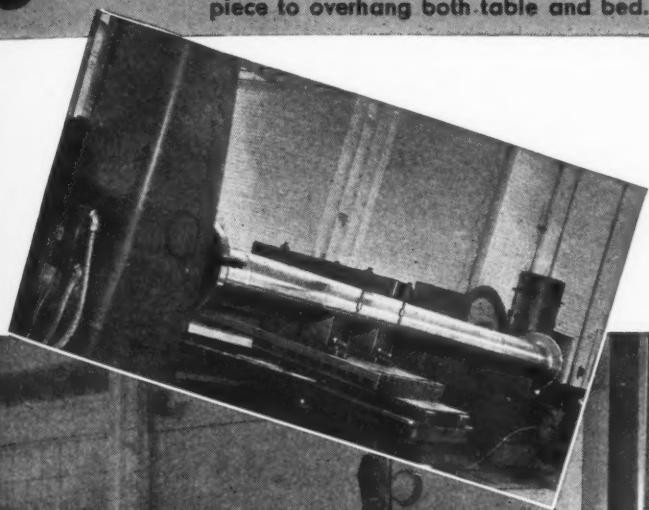
# G AND UNWIELDY WORK

## 2 VERTICAL MOUNTING

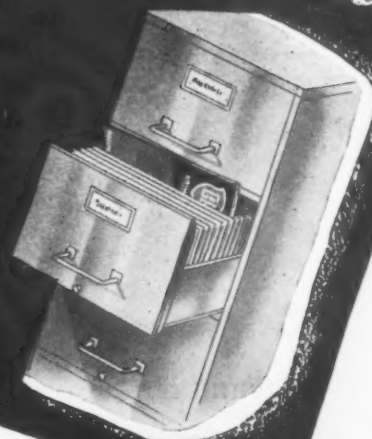
Large connecting rod being bored and threaded. This is a simple setup for unusual work.

## 3 LONGITUDINAL MOUNTING

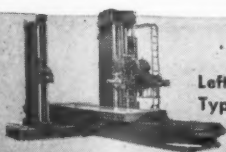
Drilling and reaming the flanged end of a large shaft. The end support has been removed to allow the work-piece to overhang both table and bed.



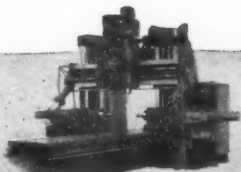
*Additional Data*



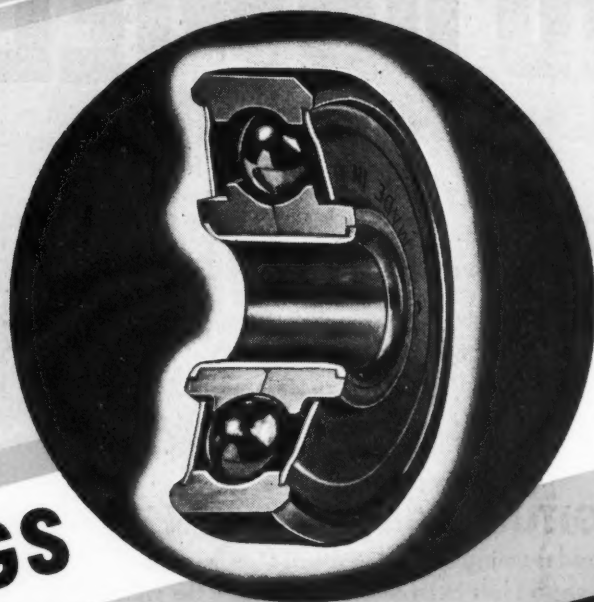
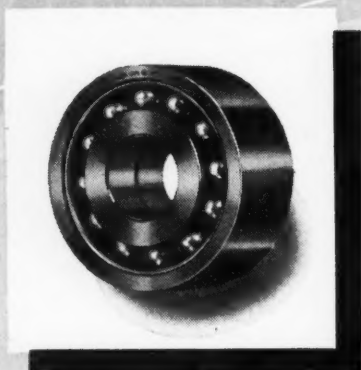
**S MACHINE TOOL CO.**  
FOND DU LAC, WIS.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.



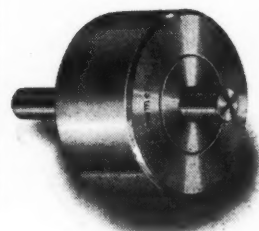
**BALL BEARINGS**

# SCHATZ

**SCHATZ** INTRODUCED MANY IMPROVEMENTS  
IN BALL BEARING MANUFACTURE NOW  
CONSIDERED STANDARD PRACTICE

**THE SCHATZ MANUFACTURING CO.**  
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT  
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*more*  
**metal-working  
PRODUCTION  
IDEAS from...**

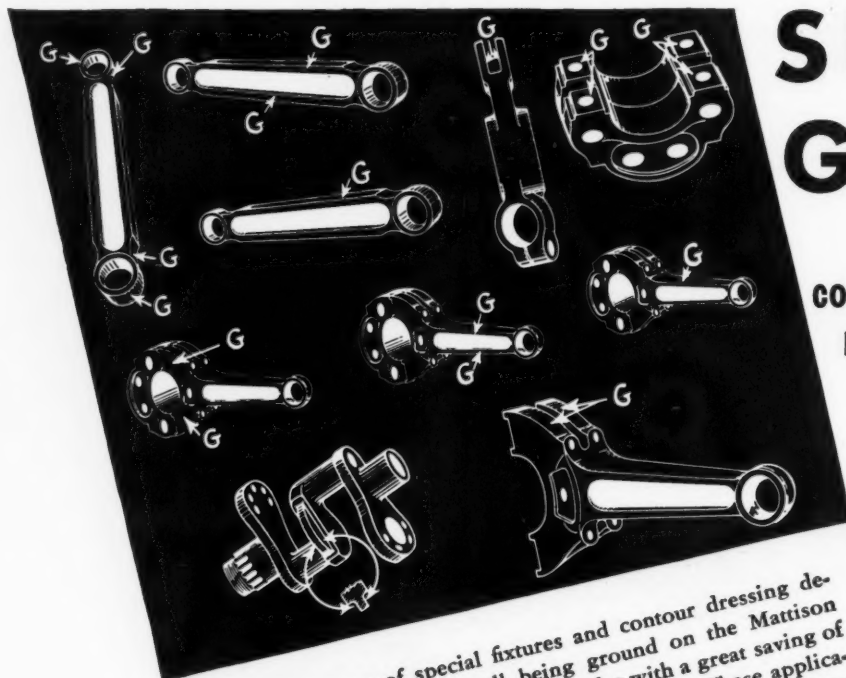
*Rockford*



**CENTER OF MACHINE TOOL PRODUCTION...**



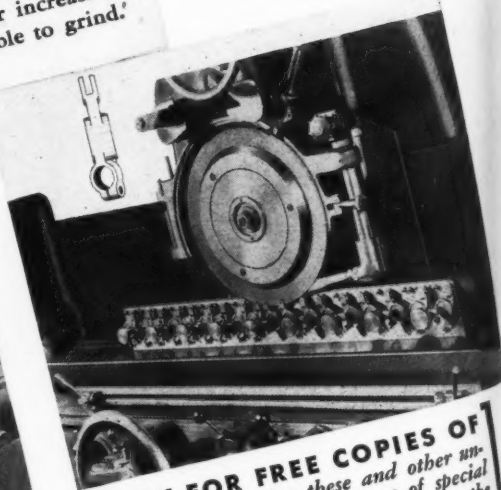
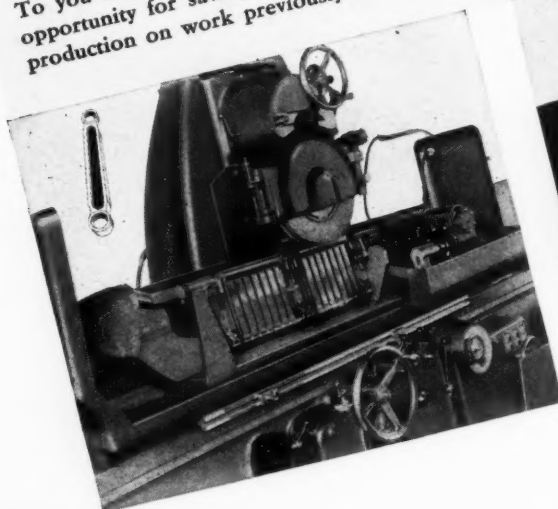
# WIDE RANGE OF FORM WORK NOW BEING GROUND ON MATTISON SURFACE GRINDERS



• A FEW EXAMPLES •

CONNECTING RODS—MASTER RODS  
BEARING CAPS—CRANKSHAFTS  
ROCKER ARMS

Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.



ASK FOR FREE COPIES OF literature showing these and other unusual jobs ground by means of special fixtures and dressing devices on the Mattison Grinder.

## MATTISON

## MACHINE WORKS

ROCKFORD • ILLINOIS

MADE IN

**ROCKFORD**...TESTED ENGINEERING AND CRAFTSMANSHIP  
ILLINOIS, U.S.A.

Machinery, August, 1944



# How Automotive Process Engineers Save Time in Producing Aircraft Engines



## Production Line of Unit-Type Machine Tools Produces More at Less Cost

Here are only six of many W. F. and John Barnes machines producing aircraft engine parts for a prominent automobile manufacturer now producing aircraft engines.

Each machine does more work faster than the machines

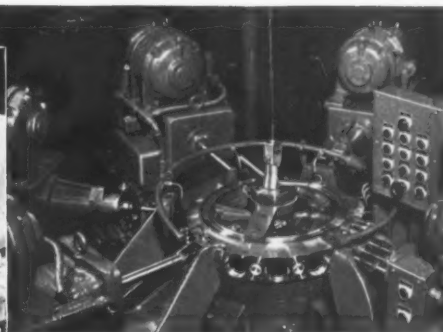
previously used for the same operations. Each is built from standard hydraulic feed and drive units which can be mounted in any position and easily arranged to accommodate reasonable changes in the design of the workpiece.



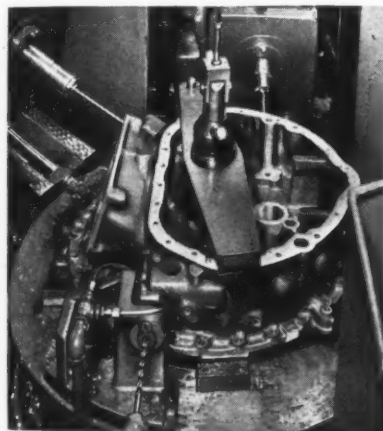
This crankcase part was formerly machined in 7 minutes and 54 seconds on conventional drilling equipment. A Barnes 3-way, 3-spindle unit-type machine cuts the machining time to 2 minutes and 6 seconds—saving 5 minutes and 48 seconds. Machine is designed so that it can be used for either step drilling or gun drilling the deep holes.



A Barnes 4-way drilling machine cuts the machining time from 6 to 3 minutes on this airplane engine crankcase. The machine utilizes four drills and an indexing fixture.



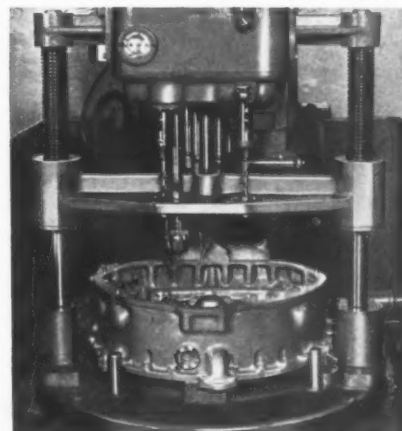
A 6-way unit-type drilling machine with index table which replaced three machines. Machine time has been cut from 15.28 minutes per part to 1.70 minutes—saving 13.58 minutes per piece. In addition to these savings, manpower was saved and handling time decreased because ten spindles work simultaneously instead of three at a time.



This machine performs three drilling operations in one-eighth the former time. Machine is a 3-spindle, 3-unit-type machine which performs the drilling operations at a savings of 9.35 minutes over the former method. It also eliminates two machines which were formerly required to do the job.



This 4-way, 12-spindle unit-type machine effected a 90% savings in machining time for drilling and reaming the airplane engine crankcase. The actual saving time is 468 seconds on each crankcase. The operations consist of drilling and reaming six holes.



Machining time was reduced from 8.90 to 1.1 minutes by combining drilling operations on this vertical machine. The operations were formerly performed on three conventional single spindle machines at a combined time of 8.9 minutes. By drilling nine holes simultaneously, additional savings were effected in handling time.

**FREE—13 Helpful Bulletins.** These two sets of bulletins illustrate how others have used Barnes special machines in solving their metal-working production problems. They also describe the proper method and procedure in obtaining special machine tools to suit a specific problem. Write for them today. Ask for Bulletins 844.



**W. F. and JOHN BARNES**

320 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



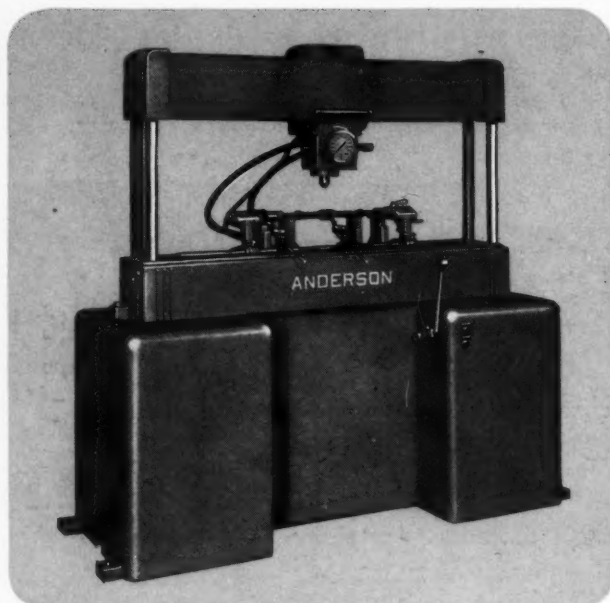
MADE IN

FOR RIGID ACCURACY IN MACHINE TOOLS... **ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, August, 1944

# *Faster* CHECKING

## FASTER STRAIGHTENING



*to .001 of an inch*  
WITH THIS HYDRAULIC PRESS

The latest type of Power Press equipped with a traveling ram. The base and hydraulic unit are the same as used on the Anderson stationary ram model which has established such an enviable performance record. Operators like its sensitive control because a shaft can be bent a thousandth at a time.

The traveling ram type of press is especially well suited for camshafts, etc. For straightening work of this kind the anvils are set up just where they are needed, then the ram can be moved wherever straightening is required.

In the old way it was necessary to move the anvil and change the setup every time a shaft was to be straightened.

Anderson Power Presses with traveling rams have a capacity of 10 tons. The traveling rams are equipped with four ball bearings, pre-lubricated and sealed. Equipped with same attachments as stationary ram type press.

These presses are perfectly adapted to the needs of airplane and automobile plants.

## *Anderson* PORTABLE POWER SCRAPER

### Saves Manpower . . . Speeds Work

Has a "natural hand control" . . . as easy to use as a hand scraper. Left hand serves as guide to the blade . . . right hand controls stroke. Pressure of left hand controls depth of cut, but forward cut requires no backbreaking labor. A slight forward pressure on cylinder with right hand starts swift, smooth forward stroke which can be regulated from nothing to 3½ feet . . . 60 feet per minute, reverse speed 90 feet per minute. Operator can work at a steady rate without tiring as ¼ h. p. motor does heavy cutting. With this machine one man can do the work of several.

The Anderson Power Scraper, mounted on an elevating truck is easily moved to any location. Machine may be plugged into any electric lamp socket and be ready for use. In scraper housing directly across from motor is a scraper blade grinder . . . a convenient, speedy means of resharpening scraper blades without leaving the machine.



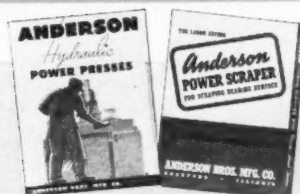
ANDERSON BROS. MFG. CO.

**Anderson**  
ROCKFORD, ILL. U.S.A.

Write for Bulletins

No. 86P on Hydraulic Power Presses

No. 86S on Power Scrapers



MADE IN  
**ROCKFORD**... FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION  
ILLINOIS, U.S.A.

Machinery, August, 1944





# HOW TO CUT TAPER SPLINES ON SHAFTS AS LONG AS 43<sup>3</sup>/<sub>4</sub>"



*...tool the job on a*  
**B-C TYPE T**  
*Hobbing Machine*



## JOB FACTS

Name of Part—Tractor Crankshaft.

Material—Heat-treated Steel Forging  
 260-302 Brinell Hardness.

Operation—Hobbing Six-key Taper Spline: 2<sup>3</sup>/<sub>4</sub>" long, 2<sup>3</sup>/<sub>8</sub>" O. D., .587"/.590" key width.

Machine—B-C Type "T" Hobbing Machine.

Hob—B-C Ground Taper Spline Hob  
 3" diameter, 4" length, 1<sup>1</sup>/<sub>4</sub>" bore.

Feed—.024" oblique, per revolution of work.

Speed—60 r.p.m.

Accuracy — Splines equally spaced, and parallel with axis of taper within  $\pm .0005$ ". Center keyways on opposite end, splines, and crank pin all held within 2° angular location.

## ADDITIONAL INFORMATION

Specific information on design and construction features of the B-C Type "T" Hobbing Machine are contained in this booklet and will be sent to you upon request. Write today for Bulletin No. F-1403.



The versatility of the B-C Type T Hobbing Machine makes it extremely useful in shops where diversified hobbing operations are demanded. Take the case of this manufacturer as an example. Specifications on this job called for 6 key taper splines on the end of long (43<sup>3</sup>/<sub>4</sub>" O.A. length) tractor crankshafts. The splines must be located within 2° of a reference based on the crank pin angle and a slot milled in the opposite end of the shaft. The job was tooled-up on a B-C Type T Hobbing Machine, with the way guard removed to accommodate the extreme length of the shaft. With this set-up, taper splines were hobbled with reasonable speed and a high degree of accuracy. Splines were held equally spaced and parallel with axis of the taper within  $\pm .0005$ ".

## HOW TO APPLY B-C TYPE T HOBGING MACHINES TO YOUR SPECIAL JOBS

This is but one of many special operations to which B-C Type T Hobbing Machines can be applied. Further information on how this machine can be applied to meet your special requirements may be secured by writing B-C Hobbing Engineering Service. This group of experienced hobbing engineers will also be pleased to answer any of your questions or aid you in the solution of any of your other hobbing problems. Feel free to consult them at any time without obligation.

HOBGING MACHINES,  
 HOBBS, HOB SHARPENING  
 MACHINES, REAMERS,  
 REAMER SHARPENING  
 MACHINES, MILLING CUT-  
 TERS, SPECIAL TOOLS

# BARBER-COLMAN COMPANY

GENERAL OFFICES AND PLANT • 109 LOOMIS ST. • ROCKFORD, ILL., U.S.A.



MADE IN

CENTER OF MACHINE TOOL EXCELLENCE... **ROCKFORD**  
 ILLINOIS, U.S.A.

Machinery, August, 1944



# AUTOMATIC LATHES

## **One Operator and 2 Sundstrand Machines Turn Out 12 Times Old Production Rate**

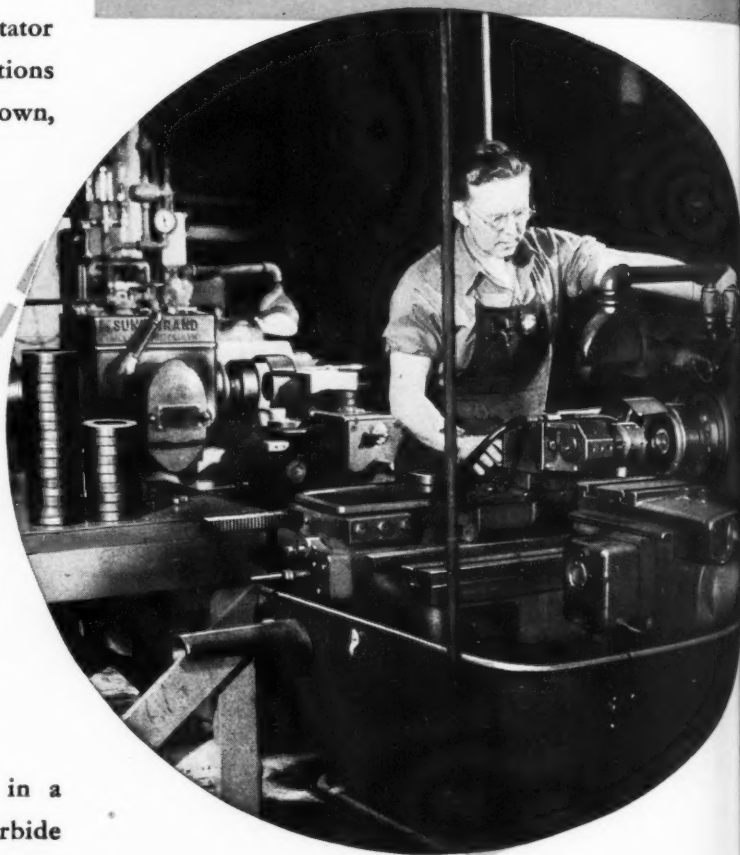
Increased production of this part was required to eliminate a bottleneck in the manufacture of "dynamotors" by a well-known electrical firm. With the installation of Sundstrand Automatic Lathes, machining time has been cut from 6 minutes to 29 seconds on the operation illustrated.

The rough part consists of a commutator assembly composed of copper laminations separated by mica segments. As shown, it is required to bore a portion of the I.D., undercut the adjoining portion, break and form the corner and face the outer surface. The job was formerly handled on a high-speed engine lathe. Machining time ran 6 minutes per piece. Because of the manually controlled cycle, an operator was required for each machine. Multiple tooling and automatic cycling on two Sundstrand Model 8 Automatic Lathes now complete this job in a matter of 29 seconds per piece. One operator handles two machines, thus effecting a substantial savings in manpower.

Three high-speed tools, mounted in a special holder, are used on this job. Carbide tipped cutting tools are also commonly used on Sundstrand Automatic Lathes.

cut turning time

*from 6 minutes  
to 29 seconds...*  
on  
copper commutator assembly



*Parts are machined on two Sundstrand Automatic Lathes by one operator.*



# SUNDSTRAND

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment

## 2530 ELEVENTH STREET

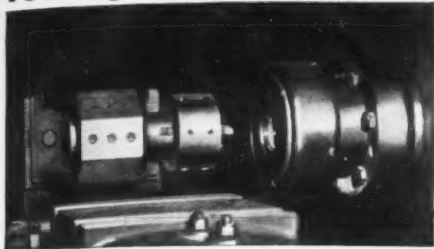
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**ROCKFORD**...FOR ACCURATE, FAST METAL REMOVAL  
ILLINOIS, U.S.A.

Machinery, August, 1944



## Tooling and Operations



Commutator assembly is held in collet type chuck, pneumatically operated. Part is located by stop against copper. Three high-speed steel cutting tools are mounted in special holder.

**Material**—Copper laminations separated by mica segments.

**Operations**—Bore portion of I. D., undercut adjoining portion, break and form corner, and face outer surface at one pass.

**Feed**—0.004 in.

**Working Stroke**— $\frac{1}{4}$  in.

**Cutting Tools**—High-speed steel.

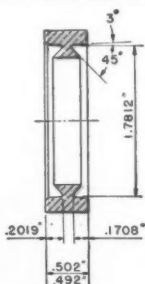
**Coolant**—None.

**Previous Machining Time**—6 minutes for one side.

**Present Machining Time**—29 seconds for one side.

**Time Saving Per Piece**—5 minutes, 31 seconds.

Drawing below shows operations performed at one pass on one side of commutator assembly. Part is then turned over for same operations on other side.



(Left) Part after machining.



(Right) Part before machining.

## Here's What Sundstrand Automatic Lathes Can Do for You on Both Long and

### *short-run work*

A machinist of average skill requires only 30 minutes to set up the automatic cycle and tooling of a Sundstrand Lathe for an average job using 5 tools. No cams are employed—three standard trip dogs adjusted on the cycle control disc handle most work. Because of this simple set-up method, Sundstrand Automatic Lathes, properly tooled, will make possible important time savings on both long and *short-run work*.

Learn what a Sundstrand can do for you—get your copy of this *free* practical book that gives details of actual applications on all kinds of work. Eleven

short-run and nine long-run jobs are described and illustrated with both photographs and tooling diagrams. You'll also find valuable production data to compare with the performance of your present equipment. Write for Book 627.



## Take Advantage of Sundstrand "Engineered Production" On Your Turning Problems

Competent Sundstrand engineers are available to analyze your problems and assist in developing effective, profit-producing tooling on the correct size of automatic lathe. Send complete specifications and prints of your latest job.



# MACHINE TOOL CO.

Drilling and Centering Machines • Special Milling and Turning Machines

ROCKFORD, ILLINOIS, U. S. A.



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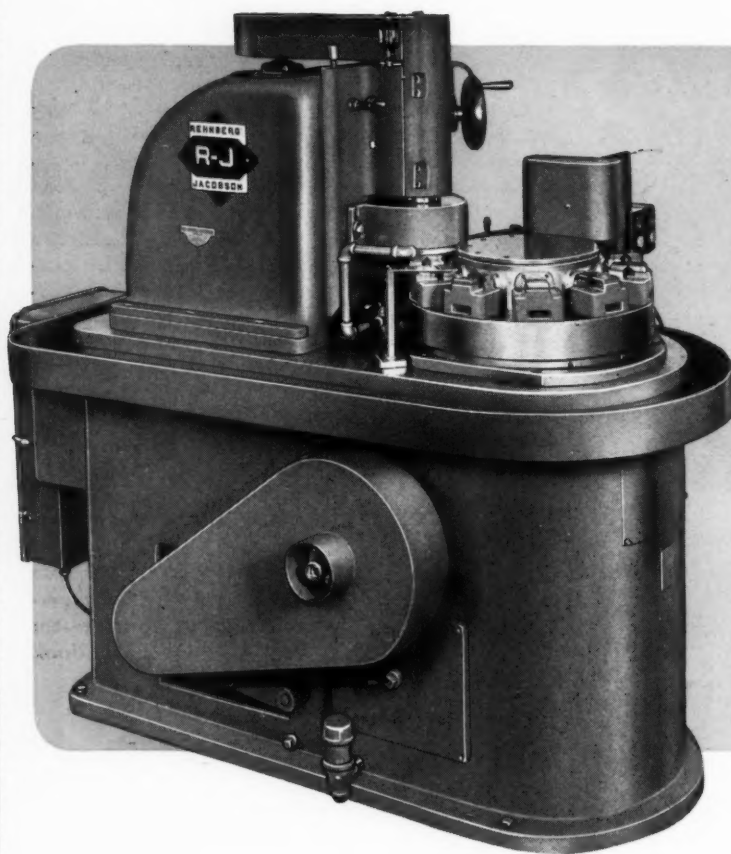
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... **ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, August, 1944

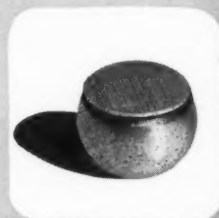


# Rehnberg-Jacobson

**AUTOMATIC MACHINE FOR GRINDING FLAT SURFACE  
ON HARD-TO-HOLD AIRCRAFT ENGINE ROCKER BALL**



**BEFORE GRINDING**



**AFTER GRINDING**

## **OPERATOR SIMPLY SETS BLANKS IN SPECIAL CHUCKS**

Here is a case of a machine designed to handle a rather tricky job. This little ball, slightly greater than  $\frac{3}{8}$ " diameter, is a hard one to hold because the only locating point is a shallow groove around the top of the spherically-ground portion. Our machine uses a set-up of ten cam-operated, two-piece chucks, each of which is designed to engage this groove. The operator simply drops a ball into each open chuck as it comes around on the constantly-running table. The line-up and proper position of each ball is then checked under a special fixture before they pass under the grinding wheel. After grinding, each chuck is opened automatically in sequence and the balls are removed by a stationary cam. This makes for a simple, effective, fast, accurate, and economical method of accomplishing an operation that might otherwise be unnecessarily wasteful of time and man-power.

We specialize in the design and manufacture of economical production machinery, generally consisting of the ingenious adaptation of simple elements. Give us an opportunity to discuss your needs with you, and let us see what we can do.



**REHNBERG-JACOBSON MANUFACTURING CO.**

*Special Machinery*

**2137 NISHWAUKEE ST. ROCKFORD, ILLINOIS**

**MADE IN**

**ROCKFORD... MACHINE TOOL SHOPPING CENTER**

**ILLINOIS, U.S.A.**

Machinery, August, 1944



# American ACCURACY

**PROVEN in Aircraft Today  
Ready for Your Product  
TOMORROW!**

Aircraft accuracy is the standard by which all other accuracy is measured. Broaching—by American—achieves this standard with production and economy never before thought possible. This is the reason why more and more forward looking manufacturers are turning to American, not alone in aircraft, but in all industry where high precision output is required.

To finish the lock-splines in a sectional aircraft engine crankshaft, a T-10-36 "three-way" American broaching machine arranged for special push-down operation is used. To insure rigid alignment, the broach is guided front and rear during the entire cutting stroke. The broach is locked in a bushing at the top, and a long front pilot passes completely through the work and into a guide bushing below before any cutting teeth engage the work. Absolute accuracy is attained.

In today's war production, in planning for tomorrow's peacetime production, the trend is unmistakably toward broaching—a better way to do many metal-working jobs, the only *right* way to do some! Let American's complete broaching service—machines, tools, and engineering—serve you. Write today for details.



*American*  
**BROACH AND  
MACHINE CO.**

ANN ARBOR, MICHIGAN  
BROACHING MACHINES  
PRESSES  
BROACHING TOOLS  
SPECIAL MACHINERY



To prevent misalignment  
and tool damage, use  
proper fitting pull heads  
with your broaching tools.

ROCKFORD

ROCKFORD MADE MEANS PRECISION MADE...

**ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, August, 1944

# FORM HELD WITHIN .00025" USING B-C UNGROUND CUTTERS



## TWO DISTINCT OPERATIONS PERFORMED SIMULTANEOUSLY

This operation calls for milling neck and radius on supercharger blades, holding form within .00025", and at the same time milling opposite end of blade, sizing for width and length. Special Barber-Colman Cutters were engineered for the job which maintain this extreme accuracy at a high production rate.

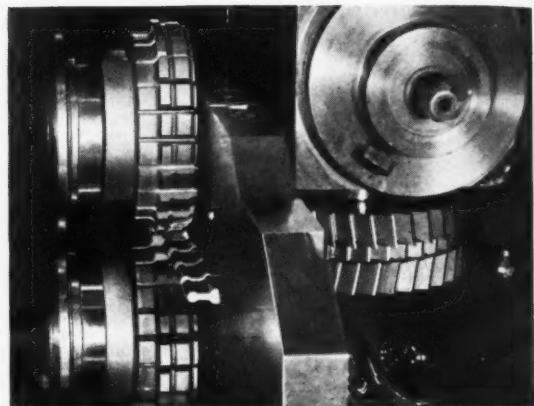
## PRODUCTION INCREASED . . . OTHER MACHINES RELEASED

B-C Unground Form Relieved Milling Cutters mounted on parallel spindles are used to form the radius



and neck. Accuracy of radius in relation to neck is held within .00025".

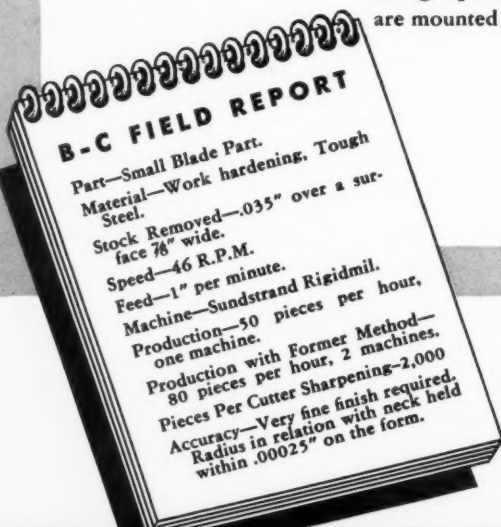
A combination gang of B-C Right and Left Half Side Mills and one Plain Mill are employed to perform the sizing operation. These are mounted on a vertical



spindle located on the opposite side of the work holding fixture. With this complete arrangement, the manufacturer is able to do the job at the rate of 50 pieces per hour on a single machine where it formerly required two machines to turn out 80 pieces per hour. Cutter life is 2,000 pieces per sharpening.

## HOW TO IMPROVE YOUR MILLING PRODUCTION

You can depend on B-C Cutter Engineering Service to furnish you with suggestions that will make greater production possible. You are invited to consult our engineers at any time concerning your milling problems. If necessary we will have our Field Consulting Engineer call at your plant. This service will not obligate you in any way.



## TO AID YOU IN YOUR MILLING PRODUCTION

Records have been compiled of outstanding cutter performance in the field. These are available in a loose-leaf binder for key production men in your shop. Simply send a request on company letterhead, signed by a person in a responsible position, and a copy will be mailed promptly. Ask for the new "Milling Cutter Data" book.



HOBBIING MACHINES,  
HOBS, HOB SHARPENING  
MACHINES, REAMERS,  
REAMER SHARPENING  
MACHINES, MILLING CUT-  
TERS, SPECIAL TOOLS

# BARBER-COLMAN COMPANY

GENERAL OFFICES AND PLANT • 109 LOOMIS ST. • ROCKFORD, ILL., U.S.A.



MADE IN

## ROCKFORD... CITY OF MACHINE TOOL SPECIALISTS

ILLINOIS, U.S.A.

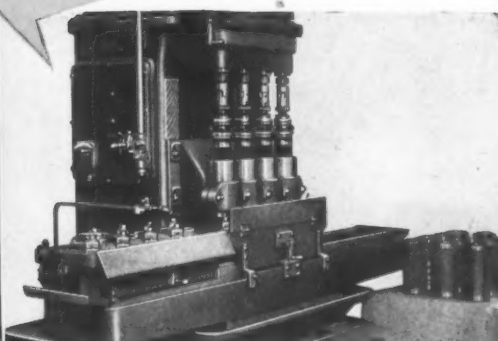
Machinery, August, 1944





*When to use  
multiple-spindle  
honing...*

(Below) This battery of **BARNESDRIL** Single Spindle Machines on aircraft cylinder assembly line hones nitrided barrels (Hardness 65 Rockwell "C") to limits of .0005" and finished to 2.5 micro-inches.



The **BARNESDRIL** 214 Machine, shown above, gives multiple honing advantages to individual parts. Special holding fixture has spare station which is reloaded during honing time.

## **BARNESDRIL** ENGINEERS WILL FIND THE ANSWER IN YOUR PART DESIGN AND PRODUCTION REQUIREMENTS



The design of your part and your production requirements determine whether or not multiple honing is the most practical solution to your internal finishing operation.

On jobs where production requirements are high, like the finishing of bores of this 8-cylinder block, shown above, **BARNESDRIL** Multiple Spindle Honers are paying for themselves in time savings. Two machines are used, the first for rough honing, and the second for mirror finish honing. The bores of the block are honed simultaneously by the 8 spindles of the Multiple Honer. Production is approximately 100 blocks per hour, whether 8, 6 or 4-cylinder blocks.

Where high production is required on individual parts, such as tractor sleeves, more than one part can be honed simultaneously on a Multiple Honer like the **BARNESDRIL** No. 214 Machine shown right above. Special fixtures designed to hold

more than one part enable the operator to hone several parts in one operation.

Less specialized honing applications where production does not warrant the use of a Multiple Spindle Honer can be handled satisfactorily with the **BARNESDRIL** Single Spindle models.

Submit your internal finishing problems to **BARNESDRIL** Engineers. The men who pioneered the field of honing machinery will study your part and recommend the machine best suited to your part design and production requirements. There is no obligation.

**GET THIS FREE DATA**—Bulletin No. M-121 describes the honing process and gives complete descriptions and specifications of the **BARNESDRIL** Honing Machines. Write for your copy today.



# **Barnes Drill Co.**

814 CHESTNUT STREET

**ROCKFORD**  
ILLINOIS, U.S.A.

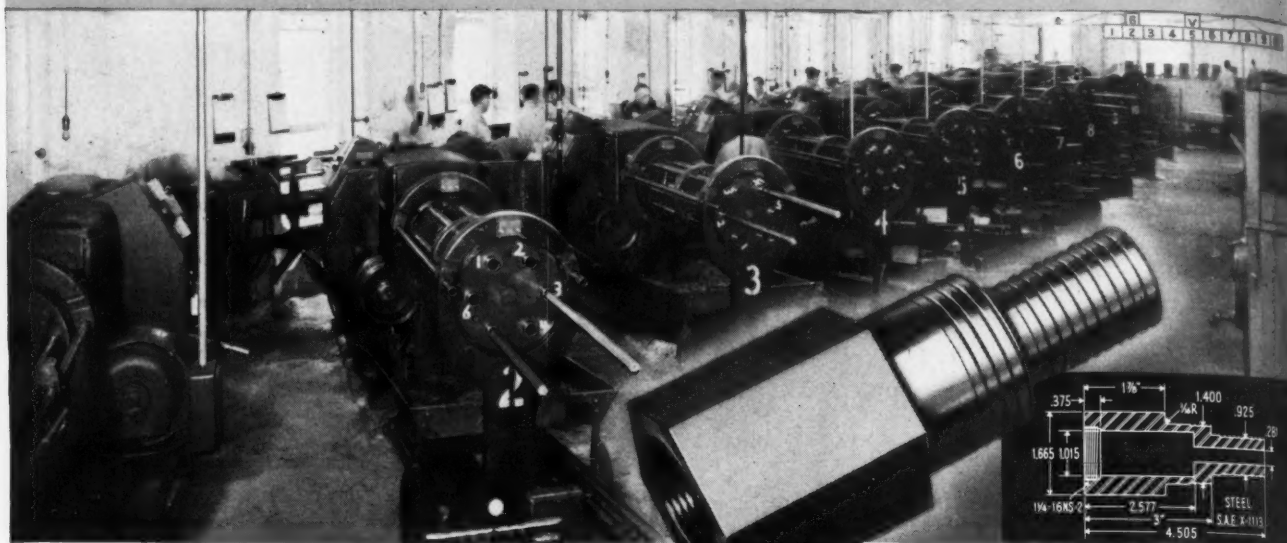
MADE IN

FOR PRODUCTION MACHINE TOOLS IT'S...

**ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, August, 1944

# INCENDIARY BOMB NOSE COMPLETED On 2" Greenlee 6-Spindle Automatics

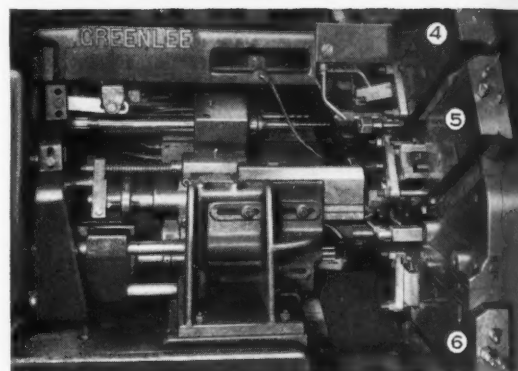
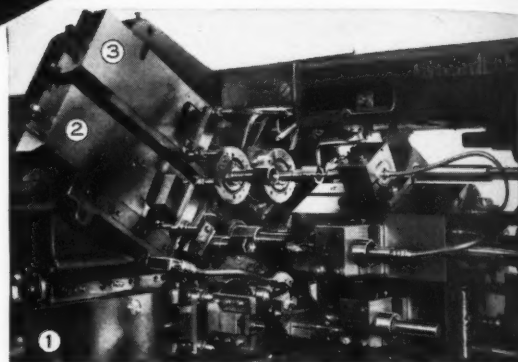
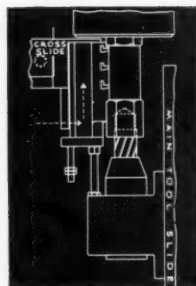


## BATAVIA METAL PRODUCTS CO. HAS STREAMLINED SET-UP

An up-to-the-minute screw machine department, complete in itself . . . inspection booth, tool room, packaging and shipping space, neatly arranged around a battery of 10 Greenlee 6-Spindle Automatics. . . saves time and speeds production of vital war parts at Batavia Metal Products Company, Batavia, Illinois. A unique inspection system, with red stop lights for each machine, affords quick control over operations. A conveyor belt, installed in front of machine line, transfers completed parts to inspection booth at rear. The Greenlees, of 2" capacity, *complete* the chemical warfare bomb nose part in fourteen operations from 1-21/32" S.A.E. X-1113 hex. stock at gross rate of 39 seconds per piece.

### FORM-TURNING ATTACHMENT SIMPLIFIES PROCESSING

Greenlee form-turning attachment avoids wide plunge cutting of stock. As illustrated, cross-slide feeds narrow tools to depth. Main tool-slide then contacts attachment, turning a uniform diameter lengthwise on piece. This Greenlee feature, also offers unusual production advantages on many other parts—may be used in five positions. Write today for more facts on Greenlee Automatics.



**TOOLING DATA** — Photos above show tooling set-up used to produce chemical warfare incendiary bomb nose. Operations are outlined below:

- 1 Form-turn hex. Drill 1" hole and counterbore for 1 1/4" tap.
- 2 Rough form small O. D. Finish drill 1" hole and chamfer.
- 3 Finish form large O. D. Drill small hole — partial depth.
- 4 Finish form small O. D. and face to length. Finish drill small hole with high speed attachment.
- 5 Groove outer diameters. Ream holes with geared reaming attachment.
- 6 Tap. Cut-off.

**GREENLEE BROS. & CO.** 1868 Mason Ave., Rockford, Illinois



MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES

• AUTOMATIC SCREW MACHINES

• AUTOMATIC TRANSFER PROCESSING MACHINES

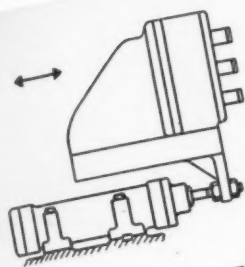
**MADE IN  
ROCKFORD**... MACHINE TOOL PLANTS CLOSE TO YOUR PLANT  
ILLINOIS, U.S.A.

Machinery, August, 1944

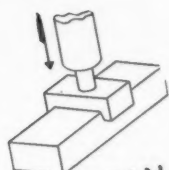




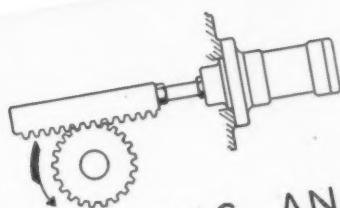
# GET ANY COMBINATION OF THESE THREE MACHINE FUNCTIONS with BARNES UNIT-TYPE COMPLETE HYDRAULIC CIRCUITS!



**FEED and TRAVERSE**  
For multiple or single tools  
—any type.

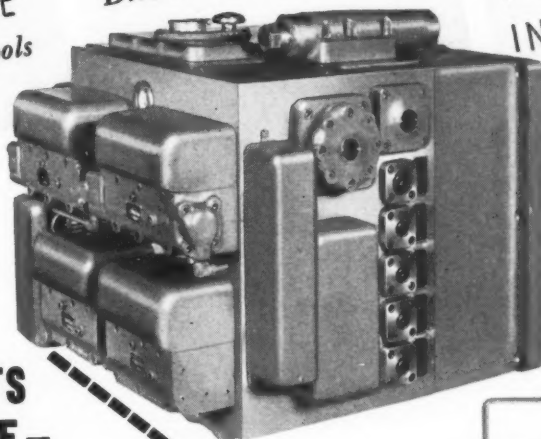


**CLAMPING**  
Direct or indirect pressure.



**INDEXING AND  
INDEX LOCATING  
PIN**

Right: Drawing of simple  
complete circuit and view  
of typical Barnes Self-  
Contained Hydraulic Unit



## COMPLETE CIRCUITS FROM ONE SOURCE— UNDIVIDED RESPONSIBILITY

**Saves Design and Assembly Time  
... Improves Machine Performance**

When designing or redesigning your machines, you can save design and assembly time, improve machine performance, and speed delivery by using the Barnes Unit-Type method of securing hydraulics. You merely establish the functions to be done hydraulically—our engineers will design the proper circuit and unit while you design the machine itself. All hydraulic elements come from one source—eliminating divided responsibility for the performance of your machine.

When your machine is ready for assembly, a complete hydraulic circuit, shipped to you in compact, self-contained units or panels, is ready to install.

The complete unit is designed and tested for the specific functions of your machine and includes the proper combination of feed, traverse, indexing and clamping. You merely connect two pipes to each cylinder of the machine to complete the hydraulic installation.



### FREE ADDITIONAL DATA

Get additional facts from this 40 page booklet containing detail descriptions of Barnes Hydraulic elements and typical installation circuits. Send today for your free copy of Bulletin M643.

# John S. Barnes Corporation

ROCKFORD, ILLINOIS

MADE IN

FOR METAL REMOVAL WITH ACCURACY AND SPEED... **ROCKFORD**

ILLINOIS, U. S. A.

Machinery, August, 1944





# Brothers, take a look!



## SEE WHAT Hy-Draulic MACHINE TOOLS CAN DO FOR YOU



Brothers-in-production, take a look at every job in your shop that will help win the war. In particular take a look at your machine tool inventory. Will additional shapers, planers, slotters or shaper-planers help you increase production, speed the victory? Do you have any such tools that are obsolete, worn out, ought to be replaced?

In any event, take a good look *now* at Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers. Investigate their exclusive advantages, ease of set-up and operation; their

precision, durability and economy. Place your orders *now* for any of these machines that you can use to help win the war. They will serve you well and continuously on war work for the duration, and equally well thereafter on commercial production. Write, today, for details. Just name the Hy-Draulic Machine Tools that you can use and ask for Bulletin 1512.

If your plant is in good shape, running smoothly to capacity on work that will help the United Nations to win the war; then, take a look at the future and buy some more U. S. War Bonds.

Photos from Harris & Ewing and Charles McKinney

4400

### ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



MADE IN  
**ROCKFORD**...A CONVENIENT SOURCE FOR PRODUCTION NEEDS  
ILLINOIS, U.S.A.

Machinery, August, 1944



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CKFORD





**Call Ryerson  
...for  
quick steel**



**CALL THE PLANT NEAREST YOU**

**CHICAGO** ..... 16th and Rockwell Sts.  
Rockwell 2121

**MILWAUKEE** ..... 320 So. 19th St.  
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**DETROIT** ..... 1600 E. Euclid Ave.  
Madison 3860

**ST. LOUIS** ..... 5 Clinton St.  
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**CINCINNATI** .. Front St. and Freeman Ave.  
Cherry 3232

**CLEVELAND** ... E. 53rd and Lakeside Ave.  
Henderson 1000

**PITTSBURGH** ..... 330 Grant St.  
Walnut 7540; Carnegie 795

**PHILADELPHIA** ..... 5200 Grays Ave.  
Bell-Belgrade 1412; Keystone-West 1644

**BUFFALO** ..... 40 Stanley St.  
Humboldt 3311

**NEW YORK** ..... 203 Westside Ave.  
Jersey City, N. J.  
New York City ..... Rector 2-3700  
Newark ..... Market 2-6067  
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**Over 10,000 kinds,  
shapes and sizes  
in stock...**

**PROMPT, PERSONAL SERVICE ASSURED**

**RYERSON STEEL-SERVICE**

How these

# 8 TOOL STEELS

reduce tool-room problems

Although Bethlehem manufactures a number of different tool steels, the group known as the Big 8 is suitable for a great majority of applications . . . in fact, these eight grades can be used on 97 per cent of your tool-steel work. At the right are their names and the type of work each one does.

By standardizing on Bethlehem's Big 8, a shop can reduce the *number* of tool steels carried in stock. This, in turn, simplifies heat-treating problems. Moreover, the final results—in terms of finished products—will equal or even surpass those obtained by working with a larger number of grades.

There is another advantage, too. Using these few specialized steels, both the tool room and the heat-treating department can readily familiarize themselves with the properties of each individual type.

You can put these tool steels to work with the assurance that every one of them is a tried-and-true campaigner, *for all eight are back on prewar analyses*. A Bethlehem engineer will be glad to explain their various qualifications.

BETHLEHEM'S **BIG 8**

BETHLEHEM  
STEEL

**CARBON TOOL STEEL** (water-hardening). For an almost endless list of dies, cutting tools, punches, etc.

**TOOL ROOM** (oil-hardening). For dies, punches, broaches, hobs, drill bushings, forming tools, gauges, and similar tools.

**OMEGA** (oil-hardening). One of the best of all shock-resisting steels. For cold-battering tools and machine parts subject to shock.

**No. 67 CHISEL** (oil-hardening). Primarily for battering and shock purposes—both hot and cold work. Also master hobs.

**AIR-HARDENING.** Another famous die steel—air-quenched, as the name implies. Develops a hardness comparable to that of liquid-quenched die steels.

**LEHIGH DIE and TOOL, H Temper** (air- or oil-hardening). Recommended where minimum deformation in heat treating is required. A steel for maximum production.

**No. 57 HOT WORK** (oil- or air-hardening). Especially suitable for tools that will work both hot steel and other hot metals.

**No. 66 HIGH SPEED** (oil-hardening). A general-purpose high-speed cutting steel with excellent red-hardness.

HANDLE 97% OF TOOL STEEL JOBS

# IN THE "WATER BUFFALO"

"Water Buffalos" made by Food Machinery Corporation carry 37 mm cannon and several machine guns, fight equally well on land or sea.



● No weapon of modern war is more amazing or effective than the L. V. T. (Landing Vehicle Tracked)—the amphibian armed and armoured tank that swims out of the ocean and rolls swiftly across the beaches, equally maneuverable on water or land.

Like many another great battle machine developed by American engineers, the "Water Buffalo" depends on Bunting Cast Bronze Bearings at many critical points. Massive Bunting Cast Bronze Synchronizer Rings assure positive and smooth power transmission.

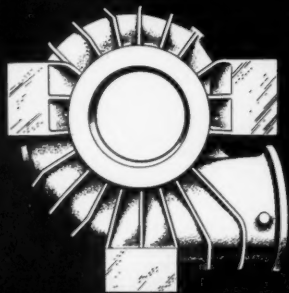
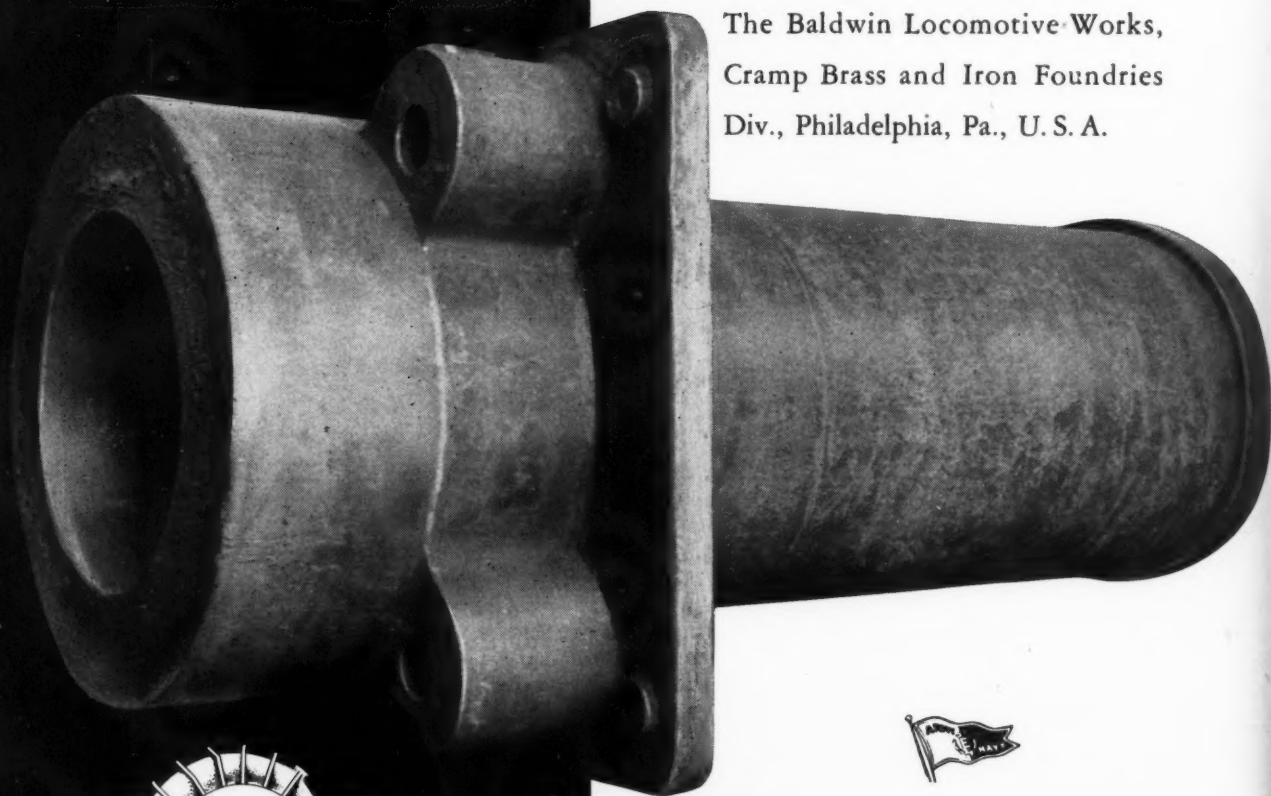
Advances in sleeve bearing design and manufacture, being tested and proved in the laboratory of war, are of urgent interest to all manufacturers and users of machinery. Bunting engineers are at your service without cost or obligation. Many sizes of completely finished Bunting Cast Bronze Bearings and Factory Finished Bronze Bars are available from stock. Write for catalog. Ask your wholesaler. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in Principal Cities.

# Bunting

BRONZE BUSHINGS ★ BEARINGS ★ PRECISION BRONZE BARS



Need large castings  
of high strength?  
**specify**  
**CRAMP IRON**  
No. 257—high test



Cramp foundries have long specialized in the production of large iron castings with the high strength factor that stands up under severe service. Cramp Iron, No. 257—High Test, cast by the cement process of molding, results in a sound finished product that conforms accurately to pattern. Castings are clean surfaced, and though tough are readily machined. One of the country's largest and best equipped pattern shops together with a laboratory for chemical and physical testing assure close control over all Cramp products. The Baldwin Locomotive Works, Cramp Brass and Iron Foundries Div., Philadelphia, Pa., U. S. A.



**BALDWIN**  
CRAMP  
**BRONZE ALLOYS**

DISTRICT OFFICES: NEW YORK, SAN FRANCISCO, CLEVELAND, NEW ORLEANS

# MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

## HIGH SPEED STEEL

## HAS WHAT TOOLMAKERS AND USERS WANT

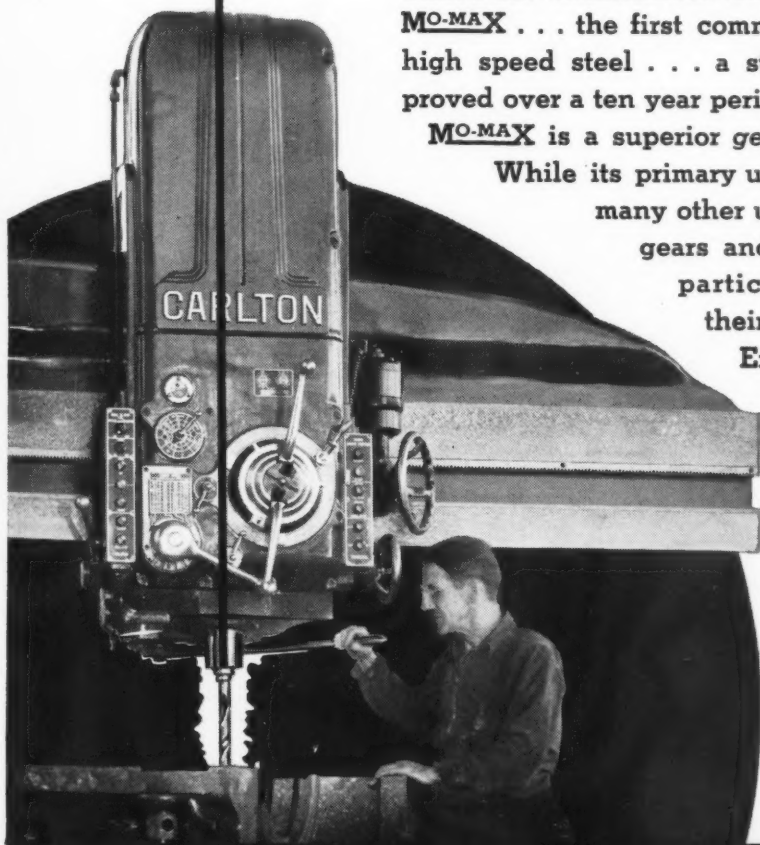
Whether you *make* metal-cutting tools or *buy* them for use in your plant, keep in mind that **MO-MAX** offers the properties you want—great toughness plus a high degree of hardness. That's the combination assured by the basic composition of **MO-MAX** . . . the first commercially successful molybdenum high speed steel . . . a steel which has been tested and proved over a ten year period.

**MO-MAX** is a superior *general purpose* high speed steel.

While its primary use is for cutting tools, it also has many other uses. It can be used for high duty gears and for wearing parts of machines, particularly those which must keep their hardness at high temperatures.

Experienced engineers and metallurgists agree that if a part can be made of high speed steel, it will be *better* if made of **MO-MAX**.

If you *make* tools, ask any one of the prominent steel producers listed below about **MO-MAX** stocks available today. If you *buy* tools, remember the brands listed.



### THEY'RE ALL MO-MAX

"LMW" . . . . . Allegheny Ludlum Steel Corp.  
"Mohican" . . . . . Atlas Steels, Ltd.  
"Bethlehem HM" . . . . . Bethlehem Steel Company  
"Mo-Cut" . . . . . Braeburn Alloy Steel Corp.  
"Star Max" . . . . . The Carpenter Steel Co.

"Molite 8" . . . . . Columbia Tool Steel Company  
"Rex-T-Mo" . . . . . Crucible Steel Co. of America  
"Di-Mol" . . . . . Henry Diston & Sons, Inc.  
"Rex-T-Mo" . . . . . Halcomb Steel Co.  
"Mogul" . . . . . Jessop Steel Company

"Tatmo" . . . . . Latrobe Electric Steel Co.  
"S. T. M." . . . . . Simonds Saw and Steel Co.  
"Mo-Tung" . . . . . Universal-Cyclops Steel Corp.  
"S-N-2" . . . . . Vanadium-Alloys Steel Co.  
"Vul-Mo" . . . . . Vulcan Crucible Steel Co.

**JOHNSON  
BRONZE**

*For your  
POSTWAR  
Product*

## SLEEVE TYPE BEARINGS



## Babbitt Lined BEARINGS

### SLEEVE TYPE BEARINGS

Cast Bronze Bearings  
Cast Bronze Graphited  
Sheet Bronze Bearings  
Sheet Bronze Graphited  
Bronze and Babbitt Bearings  
Steel and Babbitt Bearings  
Steel and Bronze Bearings  
Ledaloy  
Self-Lubricating Bearings  
Electric Motor Bearings  
Automotive Bearings  
Bronze Bars  
Bronze Castings

*Any Type*

*Any Size*

*Any Quantity*

Designers of the postwar automobile may worry about the lines of their new car . . . or synthetic rubber versus natural . . . or the thousand and one new developments that have come as a result of the present conflict. There is, however, one worry that they can forget . . . and that's the type of bearings to use in the engine. Years of research and practical tests have definitely proven that babbitt lined bearings deliver the best all around performance for internal combustion engines.

The dual construction of this type of SLEEVE BEARING provides conformability to the shaft . . . resistance to pounding . . . smooth, quiet performance at high speed . . . exceptionally long bearing life, and excellent running-in properties.

Babbitt Lined Bearings are ideal for a wide variety of applications. They are "tailor made" in the sense that you have a wide range of alloys to select from in the babbitt, and a choice of backing material—either bronze in any of the various alloys, or steel. Why not permit a Johnson Engineer to study your bearing problems? He can easily advise you on the *correct* type of bearing for each application. There is one located in the cities listed below—ready to serve you.

DISTRICT SALES OFFICES: Atlanta · Boston · Buffalo · Chicago · Cincinnati · Cleveland · Dallas  
Detroit · Kansas City · Los Angeles · Minneapolis · New Castle · New York · Newark · Philadelphia  
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**JOHNSON**

**SLEEVE BEARING**

**520 S. MILL STREET**

*The  
MOST  
COMPLETE  
SLEEVE  
BEARING  
SERVICE  
in the  
WORLD*

**BRONZE**

**HEADQUARTERS**

**NEW CASTLE, PA.**





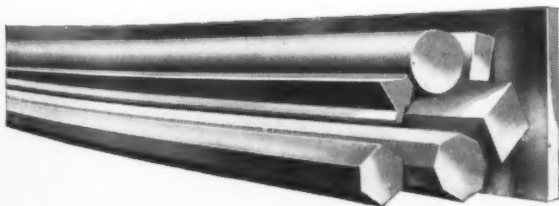
*On guard always* TO INSURE  
CONSTANT UNIFORMITY OF YOUR

# WYCKOFF

COLD FINISHED STEEL



To make absolutely sure that every bar of Wyckoff Controlled Steel meets the highest possible specifications and standards for combat equipment, machine parts, ammunition, and other essential requirements,—WYCKOFF inspectors and metallurgists are constantly checking and inspecting every bar that leaves the Wyckoff plants—to insure that constant uniformity and performance so necessary in America's all-out war production.




## WYCKOFF STEEL COMPANY

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Manufacturers of Annealed, Strain and Stress Relieved, Heat  
Treated, Quenched and Tempered Steels. Turned and Polish-  
ed, Turned and Ground Shafting.





**INVESTIGATE THESE  
WIDELY USED...  
WIDELY USEFUL...  
CORROSION-RESISTANT  
MATERIALS...**

**Lebanon**  **22**

**Lebanon**  **22XM**

**TIME** and service have proved that Lebanon

① 22 and ① 22XM stainless steels resist an exceptionally broad range of corrosive actions. They are especially adapted to use in pumps, valves, fittings, mixing blades, strainers, paddles, diffusers and kiers.

Lebanon induction furnace melting makes it possible to hold the carbon maximum of ① 22 and ① 22XM to .07.

These alloys may offer solutions to troublesome corrosion problems in your plant. A study is suggested. Write to Lebanon outlining your service conditions. Or request an interview with a Lebanon metallurgist or foundry engineer.

**MINIMUM ALLOYING ELEMENTS  
OF LEBANON ① 22 AND ① 22XM**

	Cr.	Ni.	Mo.	C. (max.)
① 22	18	8	—	.07
① 22XM	18	8	2	.07

Lebanon ① 22 and ① 22XM have been so widely adopted that even a representative list of industries using them could not be published in this space. The following are only a few of the fields to which Lebanon ① 22 and ① 22XM have been applied. Chemical • Cosmetic • Dairy and Food • Dyeing • Mining (and other fields where contaminated water is encountered) • Oil • Pulp and Paper • Refinery • Rubber • Textile

**LEBANON STEEL FOUNDRY**



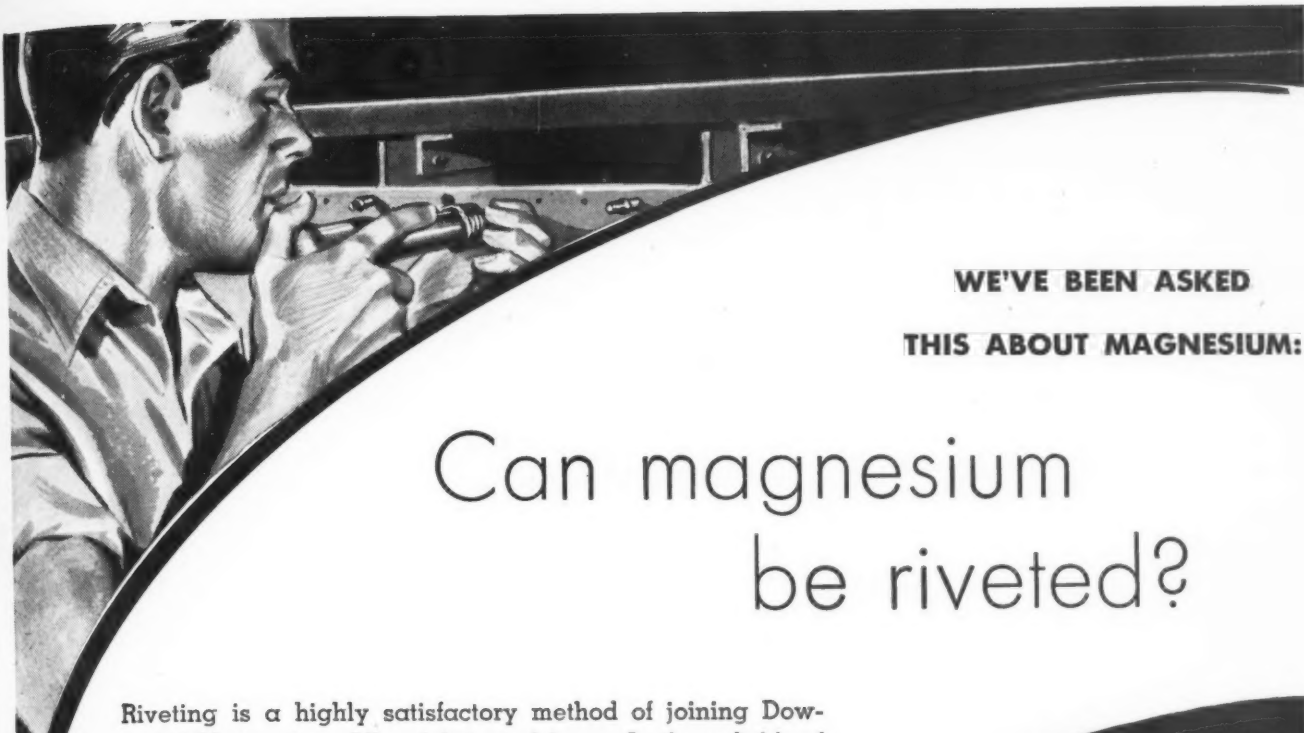
**LEBANON, PA.**

ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

**LEBANON**



**Stainless and Special Alloy STEEL CASTINGS**

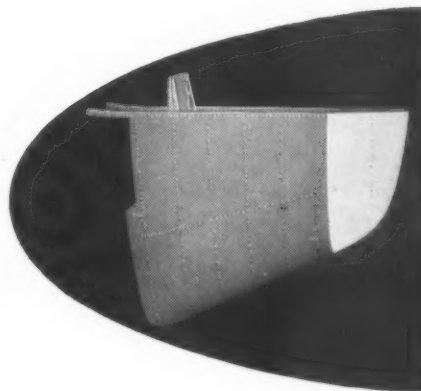


**WE'VE BEEN ASKED  
THIS ABOUT MAGNESIUM:**

## Can magnesium be riveted?

Riveting is a highly satisfactory method of joining Dowmetal Magnesium Alloy fabricated forms. In those fields of manufacture where the weight-saving and fine strength characteristics of a metal are important, Dowmetal offers a number of exceptional qualities to supplement the fact that it is the lightest of all structural metals.

Dowmetal is readily suited to hot or cold riveting by standard methods. Anodized rivets of the proper aluminum alloy are generally specified. Drilling is recommended in preference to punching, especially in heavy sheet or extruded sections. Flush heads are provided by machine countersinking or by dimpling with the correct tool. While either the squeeze riveter or hand gun can be employed, the former is preferred in most instances.



*An example of the riveting of Dowmetal sheet, as applied to an aircraft vertical fin sub-assembly.*

Dow, as the pioneer and largest producer of magnesium, has accumulated comprehensive technical data on the riveting of magnesium alloys, and on the application of the riveting technique to various types of Dowmetal fabrication. Complete facilities are maintained in the Dow plants for the actual production of riveted assemblies, in quantity as well as in small or experimental lots. Dow's experience and production capacities are readily available to assist you in any phase of Dowmetal riveting methods.

# DOWMETAL *magnesium*

**THE METAL OF MOTION**



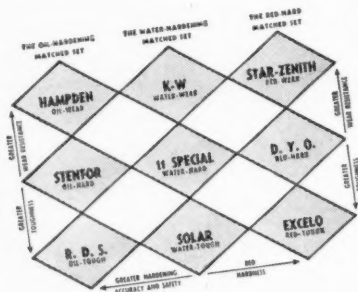
**MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY  
MIDLAND, MICHIGAN**

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

**MACHINERY, August, 1944—91**



# How **One Plant** Solved the



## Lower Unit Costs and Increased Output Result from Carpenter Matched Tool Steels

A lot depends on the selection of the right tool steel. Hardening failures, premature service failures, too frequent regrinds—very often can be traced to the choice of the wrong steel.

A prominent metal parts manufacturer was having his problems with tool steel selection. How he solved these problems with Carpenter Matched Tool Steels is shown by the examples on the opposite page. The simplified method of selection made it easy to handle successfully each job as it came up.

The nine Carpenter Matched Tool Steels also make possible lower unit costs and increased output because the *proper* type of tool steel can be selected for *each* job. Guesswork is eliminated because the man who selects the steel knows what he is doing and why.

If a certain grade of steel fails to meet the requirements of a tool, the tool maker knows exactly which steel to select in order to correct the trouble. In this manner tool-caused production troubles are held to a minimum, and increased output and lowered unit costs are the natural result.

The examples shown are typical of the manner in which hundreds of metal-working plants have discovered the benefits of Carpenter Matched Tool Steels. Thorough familiarity with the method of selection by regular use will enable any tool room to enjoy the same money-saving advantages.

If you want to find out how Matched Tool Steels can work in your plant, start with a copy of the Carpenter Matched Tool Steel Manual which gives full details. Free to tool steel users in the U. S. A. Write on your company letterhead giving title or position.

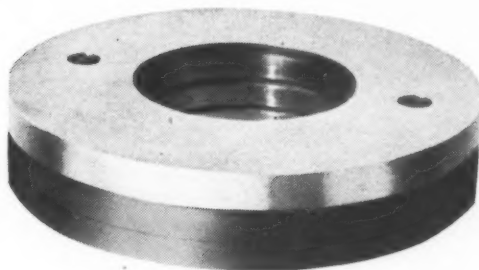
**THE CARPENTER STEEL COMPANY**  
105 W. Bern Street, Reading, Pa.



# Tool Steel Selection Problem

## PRODUCTION BOTTLENECK BROKEN

A prominent metal parts manufacturer first became acquainted with Carpenter Matched Tool Steels because of a tool-caused production bottleneck. A shaving die used in a punch press operation wore rapidly and would not hold size. An oil-hardening steel had been used but it lacked the necessary wear resistance. When Carpenter Hampden was selected for its maximum wear resistance and accuracy in hardening, production was increased from 99,600 to 504,000.



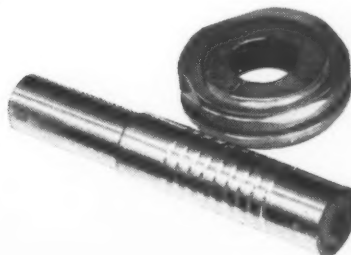
## BREAKAGE ELIMINATED

After the first successful experience with Carpenter Matched Tool Steels, the tool room tackled another job. A staking punch used to stake nuts on a spindle had a short life that averaged 40 hours. The oil-hardening steel tried, either failed by breakage when treated for maximum hardness, or battered out of shape when drawn for greater toughness. No. 11 Special, a tough timbre straight carbon water-hardening steel was tried with excellent results. Punch life went from an average of 40 hours to more than six months service, and punch was still in good condition at the end of that time.



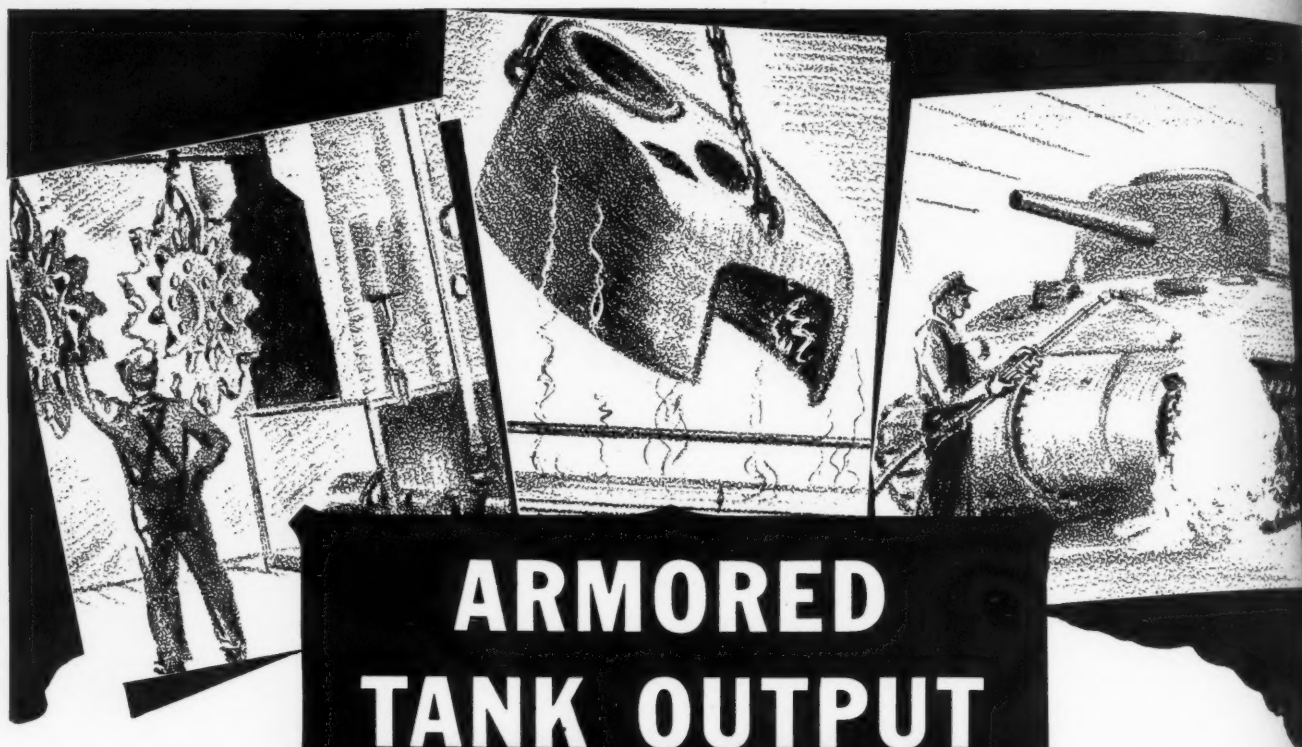
## TOOL LIFE UP 66%

Confidence in solving tool problems with Carpenter Matched Tool Steels increased with results and inspired a search for improved performance on other jobs. High speed steel had been used for a burnishing punch. The selector section in the Carpenter Matched Tool Steel Manual recommended K-W (Water-Wear) for burnishing tools. The slick glass-hard surface provided by K-W gave a smoother, cleaner finish and tool life was increased 66%.



**Carpenter** **MATCHED**   
**TOOL STEELS**

BRANCHES AT Chicago, Cleveland, Detroit, Hartford,  
St. Louis, Indianapolis, New York, Philadelphia



## ARMORED TANK OUTPUT SPEEDED BY

# OAKITE CLEANING

On every battlefield the General Sherman Tanks are delivering a Victory punch. In the home front tank arsenals specialized Oakite cleaning materials and techniques speed the Shermans along the assembly line, viz.:

**IN WASHING MACHINES:** Bogey wheels, driving cogs, volute springs are rapidly, thoroughly degreased with fast-acting, safe Oakite materials.

**IN HEATED TANKS:** Large castings and turrets are quickly stripped of rust-proofing oils and paints with heavy duty Oakite materials.

**STEAM DETERGENT CLEANING:** Oakite Solution-Lifting Steam Guns charged with special Oakite detergents speedily remove dirt, oil and carbonized greases from tanks after factory test runs and before overhaul.

**SURFACE PREPARATION BEFORE PAINTING:** To assure tenacious adhesion of paint on tanks or components, surfaces are first treated with Oakite Compound No. 35.

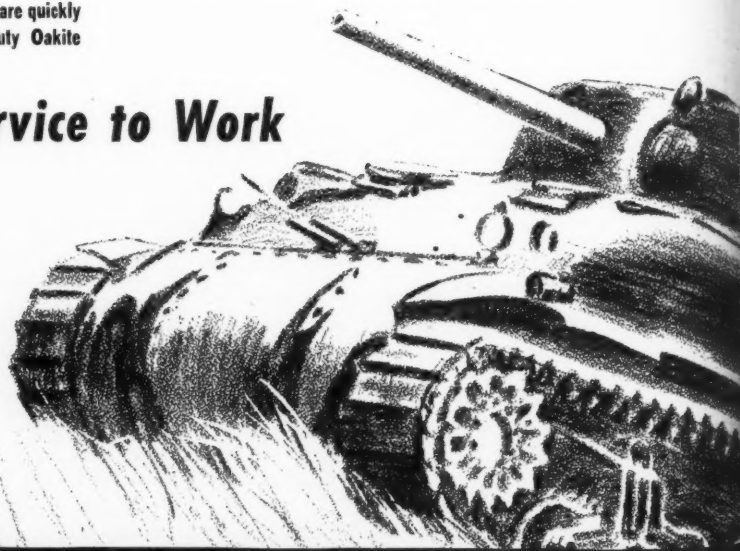
### Put Oakite Wartime Service to Work in Your Plant . . .

Each of these Oakite cleaning techniques is designed for a specific job . . . each provides maximum results. Cleaning costs are well within specified limits. Whether you make tanks, components or other war supply items, our "know-how" and successful experience are freely at your service through your nearby Oakite Technical Representative. Inquiries invited . . . promptly answered.

**OAKITE PRODUCTS, INC.**

26 Thames Street, New York 6, N. Y.

Technical Service Representatives Located in All  
Principal Cities of the United States and Canada





*"made from*  
**INGERSOLL**  
*D-B-L STEEL"*

# 5 YEARS EXPERIENCE

*in the Production of  
this Lower Cost Type of*

**HIGH SPEED  
STEEL for  
HACK SAW BLADES**

★ ★ ★ ★ ★

Specify Ingersoll D-B-L Steel for  
your Hack Saw Blades on its 5-year  
Record of Past Performance.

## INGERSOLL D-B-L

(Tungsten ..... 5.00-6.00)  
(Molybdenum... 4.00-5.00)

The remarkable performance of Ingersoll D-B-L...its relative freedom from decarburization...its tough cutting quality and its high impact resistance...plus its lower cost, have made it a wartime favorite.

## INGERSOLL SPECIAL STEELS FOR SPECIAL USES

Alloy Steels  
Armor Plate  
Clutch Plate Steels

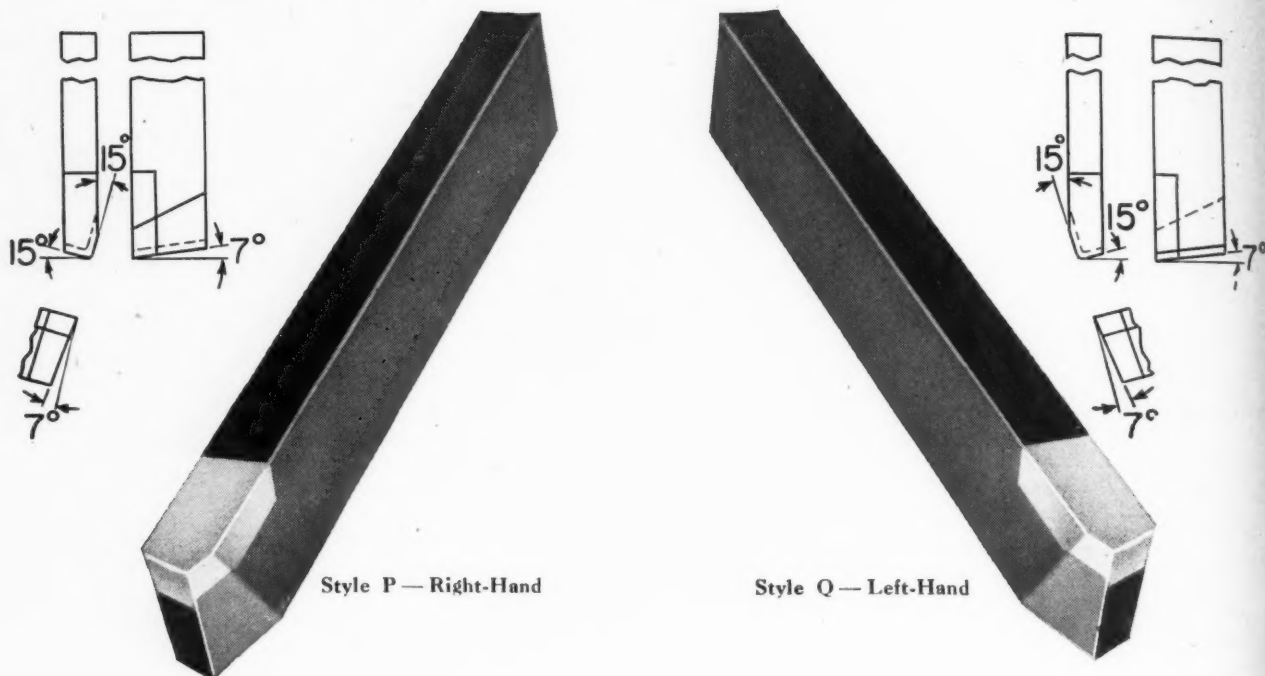
Tillage Steels  
Soft Center Steels  
Shovel Steels

Knife Steels  
TEM-CROSS Steel  
Ingaclad (Stainless-Clad Steel)

Stainless Steels and Saw Steels,  
including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

# TWO NEW HAYNES STELLITE 98M2-TIPPED TOOLS

## *Designed For Machining Steel*



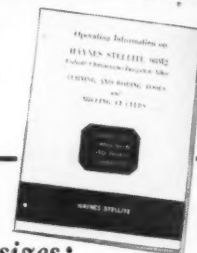
Style P — Right-Hand

Style Q — Left-Hand

●Two new styles of HAYNES STELLITE 98M2-tipped tools especially designed for machining steel are now available. These tools, designated as Style P and Style Q, consist of a cutting tip of HAYNES STELLITE 98M2 cobalt-base alloy brazed or butt-welded to a tough steel shank, with correct clearance and lead angles ground for turning steel, but with the tool tops flat so that users can grind their own side-rake angle for each particular job.

For more information on how these and other HAYNES STELLITE tools — tipped or solid — can be

used to increase production at lower cost per piece machined, write for the booklet, "Operating Information on Haynes Stellite 98M2 Tools." Ask for Form 5350.



*These new tools are  
stocked in five shank sizes:*

$\frac{5}{8}$  x  $1\frac{1}{4}$  x 8 in.

1 x 1 x 7 in.

$\frac{3}{4}$  x  $1\frac{1}{2}$  x 9 in.

1 x  $1\frac{1}{4}$  x 7 in.

$1\frac{1}{4}$  x  $1\frac{1}{4}$  x 7 in.

**HAYNES STELLITE**  
TRADE-MARK

**HAYNES STELLITE COMPANY**

Unit of Union Carbide and Carbon Corporation

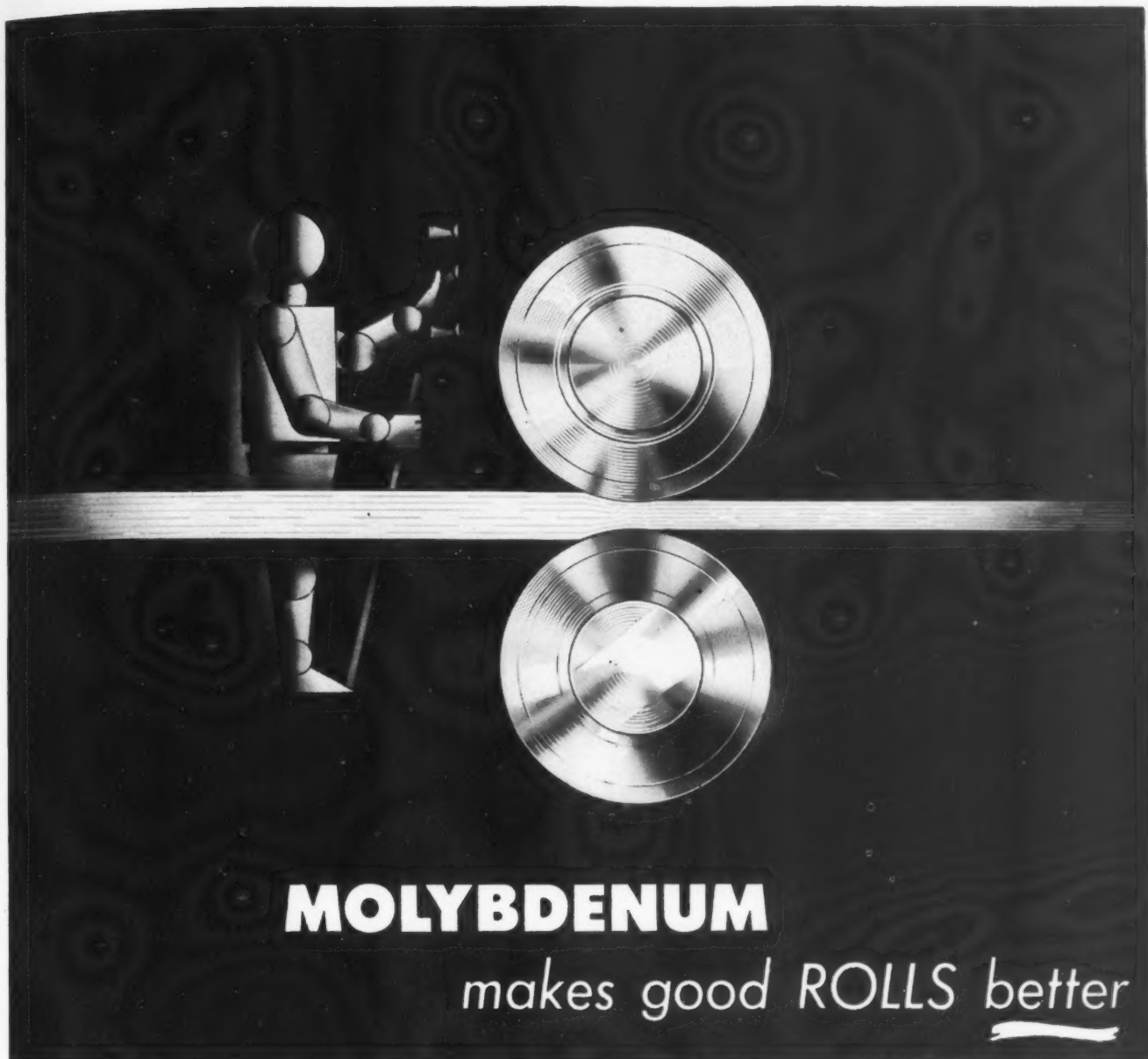
General Office and Works **UCC** Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—New York—San Francisco—Tulsa

BUY UNITED STATES WAR BONDS AND STAMPS

**• HIGH-PRODUCTION METAL-CUTTING TOOLS •**

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.



**MOLYBDENUM**  
makes good *ROLLS* better

An addition of .20% to .50% of Molybdenum—so says a leading manufacturer of rolling mill equipment—accounts mainly for the difference between a good plain chilled roll and a roll that is much stronger, tougher, and better adapted for operating at high temperatures. Improved quality in the roll itself results in a better sustained output of superior quality, at lower unit cost. Electrical sheets, furniture stock, fender stock, and auto-body sheets are examples of products more successfully turned out by the molybdenum-alloyed roll.

Rolls are among many cast and wrought steel and iron products that have been greatly improved by alloying and by newly developed plant procedures in recent years. Very small additions, rightly introduced, yield surprising results.

Inquiries concerning any problem on which

Molybdenum, Tungsten, or Boron may be useful, will be welcomed by the Molybdenum Corporation.



**AMERICAN** Production, American Distribution,  
American Control—Completely Integrated.  
Offices: Pittsburgh, New York, Chicago, Detroit,  
Los Angeles, San Francisco, Seattle.  
Sales Representatives: Edgar L. Fink, Detroit; H. C.  
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Works: Washington, Pa.; York, Pa.  
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**MOLYBDENUM**

**CORPORATION OF AMERICA**  
GRANT BUILDING      PITTSBURGH, PA.

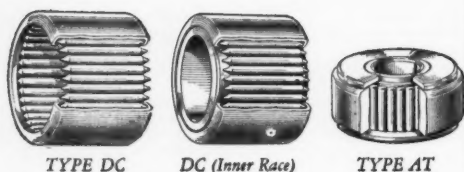


MACHINERY, August, 1944—97



# Needle Bearings

## Aid Design Simplification



TYPE DC

DC (Inner Race)

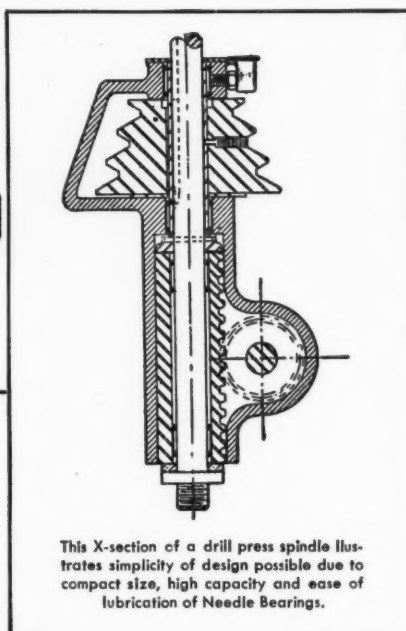
TYPE AT

### FEATURES OF THESE MODERN ANTI-FRICTION UNITS ALL CONTRIBUTE TO INCREASED OPERATING EFFICIENCY

In almost any application where Torrington Needle Bearings are employed, the design problem is simplified—due to the unusual combination of advantages which these modern anti-friction bearings offer.

The advantage of higher capacity in smaller space, for example, means that smaller, simpler housings may be employed. This in turn means less material is required in the housings, with a consequent reduction in weight and lighter, more compact design of other members is often made possible.

The efficient lubrication of Torrington Needle Bearings is another feature which aids the designer. The retaining raceway which holds the full complement of needle rollers also provides a natural reservoir for retention of the lubricant. Thus, in most designs, need for auxiliary seals and special lubricating systems is eliminated. In fact, in certain applications, Needle Bearings lubricated on installation, will operate entirely satisfactorily without further service attention during the life of the product!

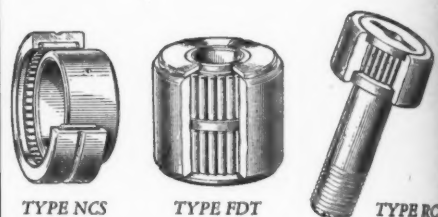


This X-section of a drill press spindle illustrates simplicity of design possible due to compact size, high capacity and ease of lubrication of Needle Bearings.

### Assembly Also Simplified

Production and assembly problems are also simplified, thanks to the ease of handling and installation of Torrington Needle Bearings. The designer need only provide the simplest type of bearing mount—a bore machined to proper dimensions. Also, as Needle Bearings will not creep or slip, spacers or other locking devices are not necessary to hold them in place under either rotating or oscillating operation.

All of these features contribute to simplification of design—with resulting



TYPE NCS

TYPE FDT

TYPE RC

increases in operating efficiency, longer service life and manufacturing economies that are helping now in meeting wartime production. And they will be of equal value in meeting the demands for the peacetime products of tomorrow. Investigate for yourself the ways in which Torrington Needle Bearings will aid your postwar plans. The Torrington Needle Bearing Catalog 30-A gives more complete information. In addition, the services and experience of our engineering department are available to assist you in securing full advantages of the application of Needle Bearings in *your* products.

### THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.  
"Makers of Needle Bearings and Needle Bearing Rollers"

New York  
Detroit  
San Francisco  
Toronto

Boston  
Cleveland  
Chicago

Philadelphia  
Seattle  
Los Angeles  
London, England



# TORRINGTON

## NEEDLE BEARINGS

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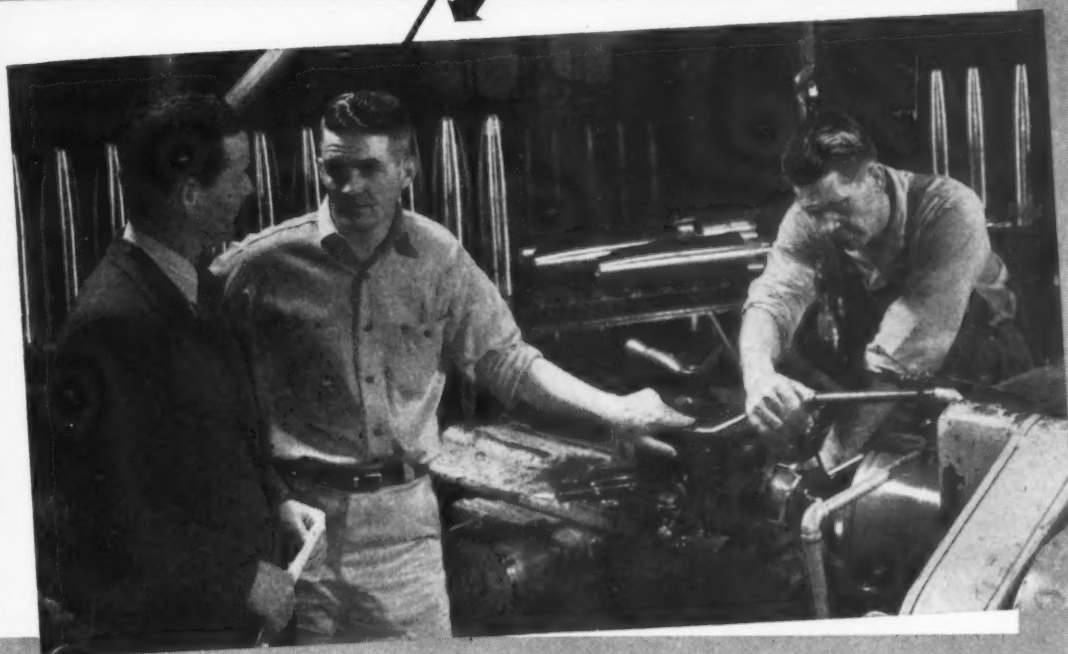


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**"Gulf Cutting Oils and Gulf Engineering Service  
have helped us top our production quota" —**

**says this shell plant Superintendent**



(Above) Actual photo of a Gulf Service Engineer consulting with the Superintendent of Crown Tool Company on cutting oil requirements for threading shells. (Below) Close-up of nose threading operation.



**"With Gulf Lasupar Cutting Oil, chaser life has  
been increased several hundred percent" —**

**BACK THE  
ATTACK . . .  
BUY MORE  
WAR BONDS!**



**GULF OIL CORPORATION • GULF REFINING COMPANY**  
GULF BUILDING, PITTSBURGH 30, PA.

**G**ULF CUTTING OILS and Gulf Engineering Service have been responsible for a marked improvement in our machining practice, which has aided us in topping our production quota" says this shell plant Superintendent. "Outstanding results with Gulf Cutting Oils include a several hundred percent increase in chaser life."

This is one of many war plants that have improved machining practice by using Gulf Cutting Oils and by adopting the practical suggestions of trained and experienced Gulf Service Engineers.

Gulf performance-proven cutting oils have established records on the toughest steels and most punishing schedules that the armament industry offers. You'll find them helpful in improving production and tool life now and in paring costs below competitive levels in the postwar period.

Let a Gulf Service Engineer show you why Gulf Cutting Oils are ideal for many of your machining jobs. Write, wire, or phone your nearest Gulf office today.

MACHINERY, August, 1944—99



"Hydraulic" Cylinders are efficiently designed, ruggedly built, to do the job right under even the most severe operating conditions.



This and the two illustrations show just two of the complete line of "Hydraulic" Cylinders with various types of mountings.



Above—hand-operated 4-way "Hydraulic" Control Valve (Type HCC75), used where remote control is not desired. Pressure range 0-1000 lb. Pipe sizes  $\frac{3}{4}$ " to  $1\frac{1}{4}$ ".



4-way "Hydraulic" Control Valve (Type U100), solenoid-operated. Push button control. Pressure range 0-1000 lb. Pipe sizes  $\frac{3}{4}$ " to  $1\frac{1}{4}$ ". Booklet (right) describes full line.

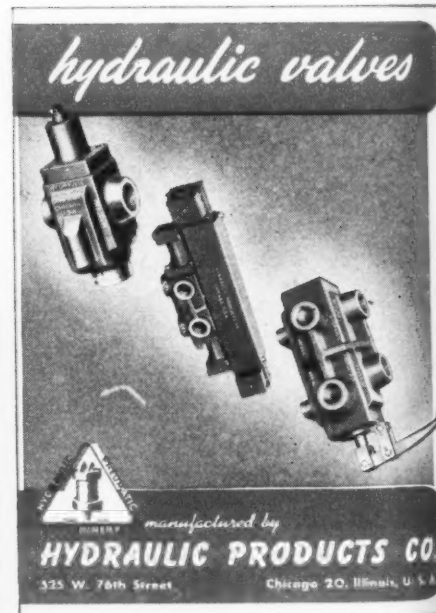
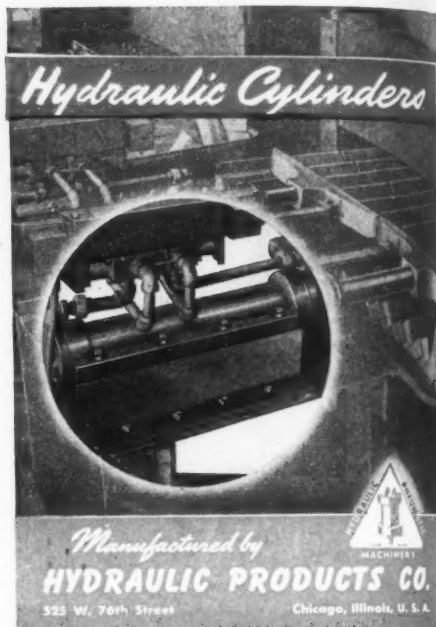


★ A large part of our plant capacity is devoted to war work. But so far as possible, we are keeping our regular products available for your use. Bulletins give complete engineering data and details. Write

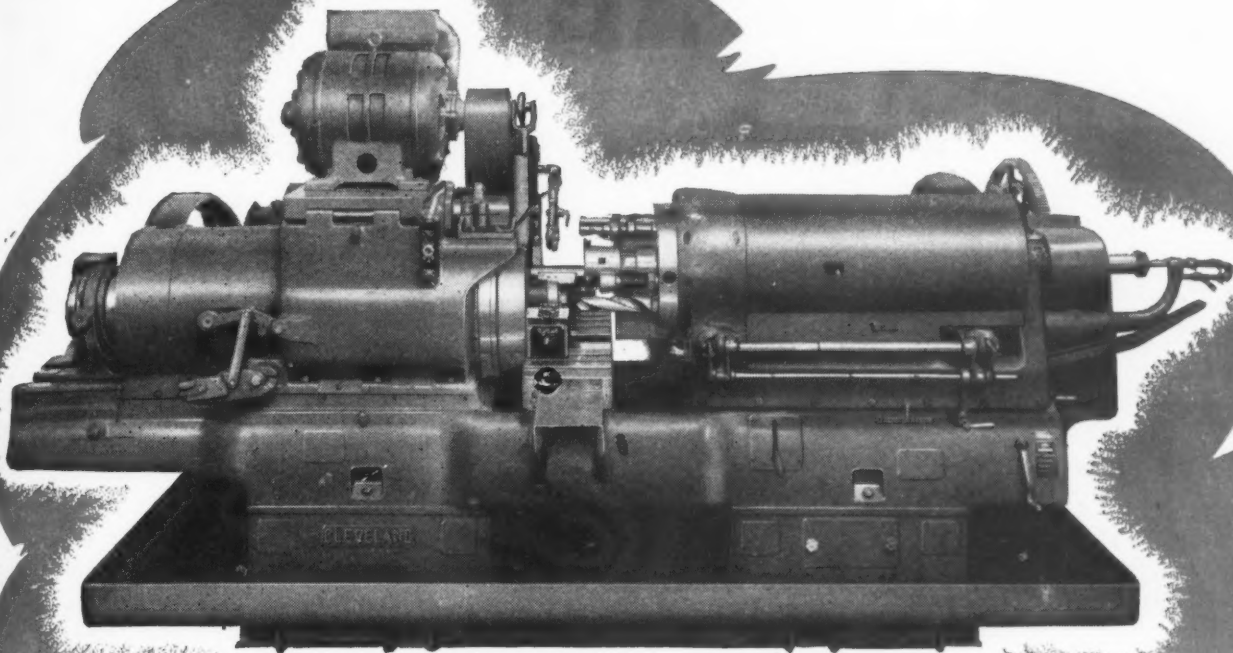
# "HYDRAULIC PRODUCTS" —for Efficiency

For smooth, uniform, dependable Hydraulic Power applied to machine control and actuation—investigate the complete "Hydraulic Products" line. We build a Hydraulic Power Unit, a wide range of Hydraulic Control and Relief Valves for remote control or for control right at the machine, and a full line of Hydraulic Cylinders with various mountings for different types of application. Send for bulletins shown below!

Write for these two new bulletins TODAY. They give helpful data on the application of "Hydraulic Efficiency" to your equipment. If you describe your requirements in detail, our engineers will be glad to make recommendations. No obligation.



**HYDRAULIC PRODUCTS CO.**  
525 W. 76 TH ST, CHICAGO, ILL., U.S.A.



*There Are*  
**CLEVELANDS**  
*Big Enough*

*Remember—  
 CLEVELANDS  
 CUT COSTS!*

**SALES OFFICES**

**CHICAGO:**

1408 Civic Opera Building

**DETROIT:**

540 New Center Building

**NEWARK:**

902 American Insurance Bldg.

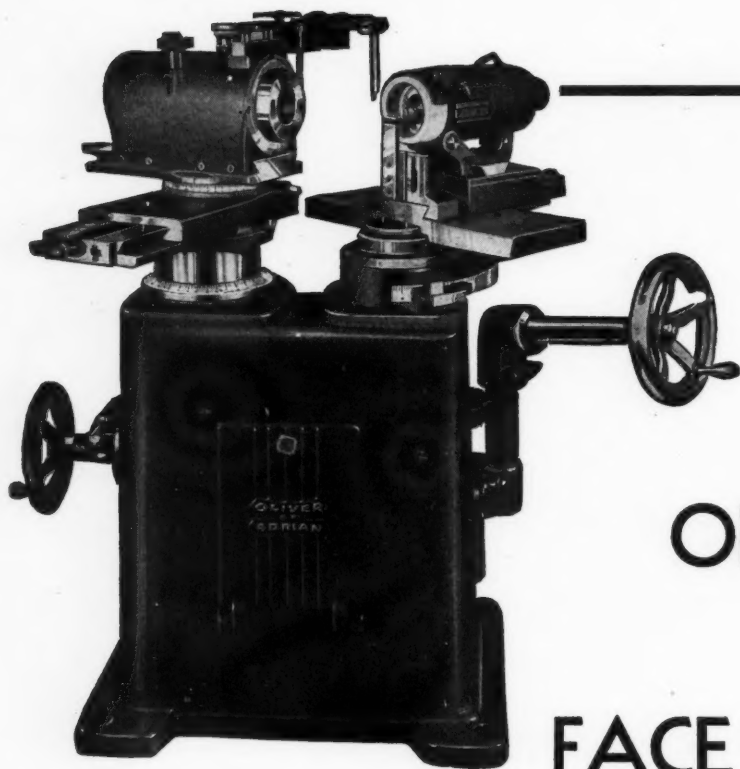
**CINCINNATI:**

1315 American Building

... for really heavy full automatic work, like this Model A 10" Cleveland. There are Clevelands small enough for high production on bar stock down to 9/16"—and a wide range of models for every size between. All of them save money because they *set up quickly* and produce rapidly, multiple operations often requiring two or more individually manned machines of other types. ● Also Cleveland-made high pressure hydraulic die-casting machines for magnesium, aluminum, brass, bronze, zinc, tin or lead. ● *Ask for Cleveland bulletins on automatic or die-casting production equipment.*

**THE CLEVELAND AUTOMATIC MACHINE CO.**  
 CLEVELAND 3, OHIO





- Less grinding time!
- Improved work!
- Longer cutter life!

—with the

## OLIVER No. 2 ARC FACE MILL GRINDER

### 3 BIG ADVANTAGES!

(1) Grinds the correct face and periphery on all types of face mills, creating a round corner between these two surfaces, thus decreasing danger of cutter breakage caused by sharp corners. (2) Performs these operations in one continuous movement, thus making it necessary to index the cutter only one-third the number of times—a real hour-saver. (3) Requires only a few simple adjustments to set up for any cutter from 6" to 26" in diameter, for any angle from 0 deg. to 90 deg., for any angle of "dish," plus or minus.

**Don't Neglect  
Your Toolroom  
It's the Backbone  
of Production!**

Today, in the era of the heavy-duty milling machine equipped with high speed cutters to match, cutters must be ground RIGHT. Today's heavy war schedules demand that they be ground FAST. And in plants all over the nation, they're finding that the Oliver No. 2 ARC Face Mill Grinder is the Machine that does the job correctly and quickly. It grinds the correct face and periphery on all types of face mills, and creates a round corner between these two surfaces, blending the corner exactly into the cutting edges—and giving the form that results in maximum production and greatly reduced cutter breakage. (Check "3 Big Advantages" at left.)

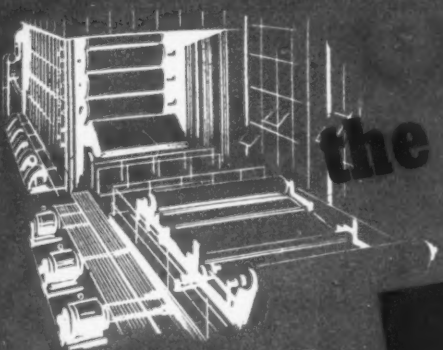
This Machine will sharpen any radius from 0" to 2"; any angle from 0° to 90°; any angle of dish, plus or minus; cutters from 6" to 26" dia. Accuracy and uniformity of all cutter teeth is assured, with smoothness of surface that results in longer life and greater precision on all milling operations. Extra sturdy. Precision-built throughout. (No. 2A Machine, not illustrated, available for smaller work, 1" to 6" dia.) Write for details.

**OLIVER INSTRUMENT CO.**  
1410 E. Maumee St., Adrian, Michigan

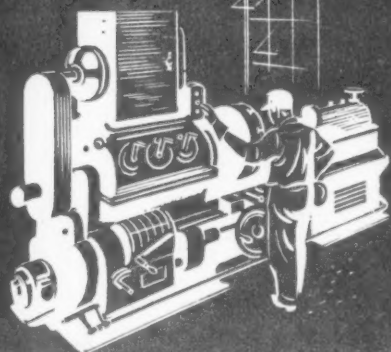
**Oliver**  
**OF ADRIAN**

**AUTOMATIC DRILL GRINDERS—TOOL  
AND CUTTER GRINDERS—DRILL  
POINT THINNERS—TEMPLATE  
TOOL GRINDERS—FACE MILL  
GRINDERS—DIEMAKING MACHINES**

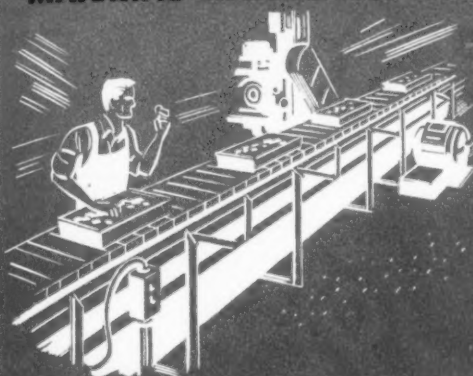
PAPER



MACHINE TOOLS



MATERIAL HANDLING

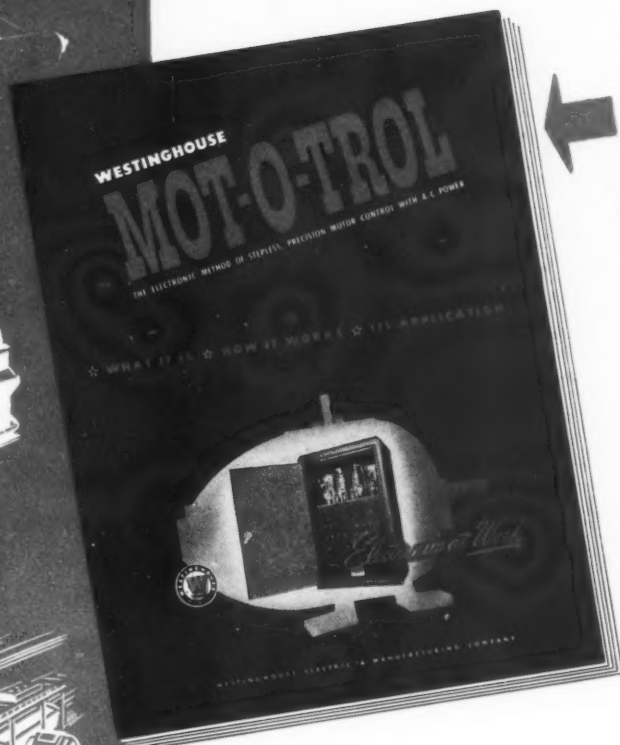


POWER GENERATION,  
HEATING AND VENTILATING



**Westinghouse**  
PLANTS IN 25 CITIES OFFICES EVERYWHERE

the answer is in this book



ELECTRONIC

MOTOR  
CONTROL

## How to get Stepless d-c Motor Speeds from an a-c Current Supply

Mot-o-Trol, developed by Westinghouse, employs the precision of electronics to provide a new, wide, *stepless* range of speed control for d-c motors from an a-c current source. It starts motors, brings them up to preset speed smoothly and rapidly. It permits wide change of speed at any time, regulates speed under varying loads, applies dynamic braking for timed stopping—and reverses the motor. Many other functions are also possible. There are no separate linestarters—no field rheostats. To get all the facts about this new packaged motor drive, write today for your copy of booklet B-3301. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

J-21306

**MOT-O-TROL**

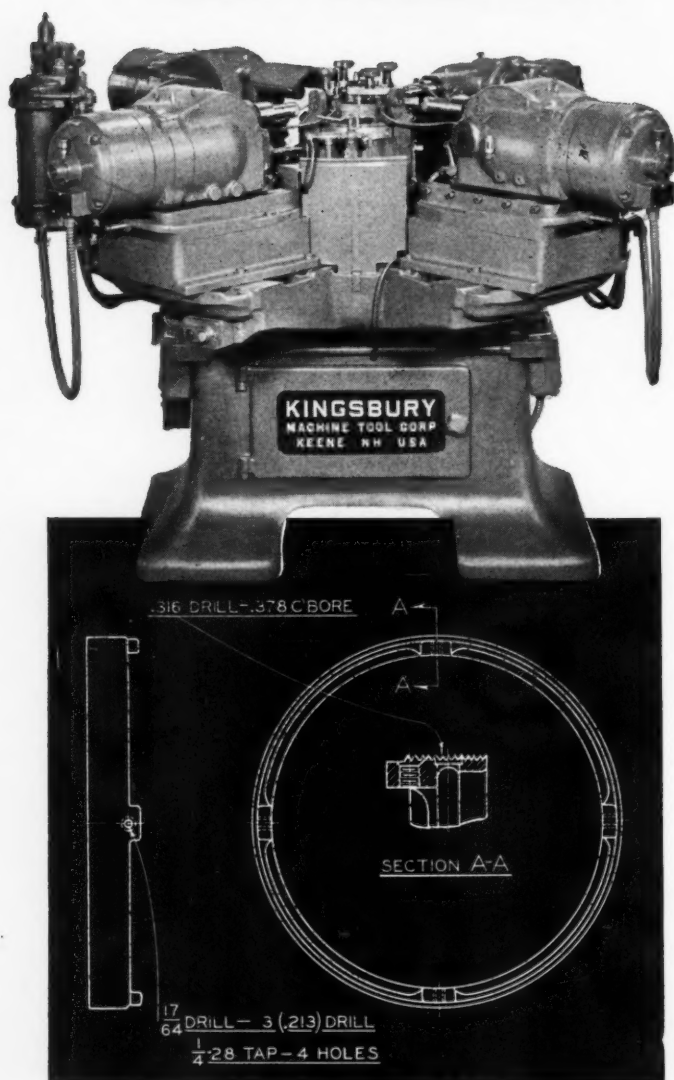


*Electronics at Work*

# FLEXIMATIC

*by* **KINGSBURY**

*Produces Accurate  
Aircraft Parts  
in One Chucking*



**I**N precision jobs on aircraft parts, FLEXIMATICS are demonstrating their speed, ease of operation and accuracy, enabling unskilled operators to produce complicated parts to high degrees of precision. The machine illustrated is a case in point. In one chucking it drills, counterbores, countersinks and taps five holes in dome retaining nuts for airplane propellers. The work is clamped in the fixture, the machine is tripped and thereupon functions automatically, indexing the work and performing the various operations until they are all completed.

The FLEXIMATIC method of mounting any number of units on one of several types of standard bases speeds up tremendously the designing of special purpose machines. And this method has the added advantage of FLEXIBILITY that permits quick changeovers to meet varying design and machining requirements.



**THIS IS  
ANOTHER**

*Fleximatic*

**AIRCRAFT JOB!**





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# *Ready for a Tough Assignment*

## THAT LOOKS EASY

THE hole is drilled—the tough metal has been removed at lowest cost with a Red Shield Brand Drill. The Reamer's task is but to size it to the correct dimension, and leave a mirror smooth finish to provide a perfect fit for the connecting member. It looks easy.

To attain perfection is never easy. This is the assignment for which each Shield Brand Reamer is designed, constructed, finished, heat treated, tempered, inspected, tested, and finally carefully packed to protect its cutting edges until it reaches you.

The best evidence that Shield Brand Reamers meet this assignment 100% is the fact that they are specified, preferred and used in ever increasing numbers by America's mass production industries where the interchangeability of parts requires perfection in dimension at each manufacturing step. We welcome your inquiry.

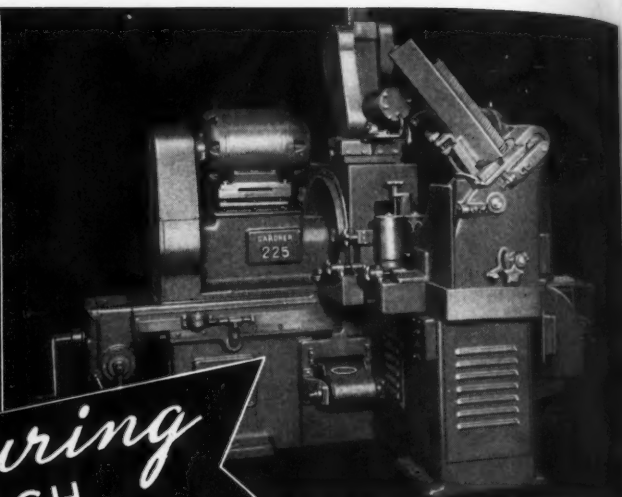
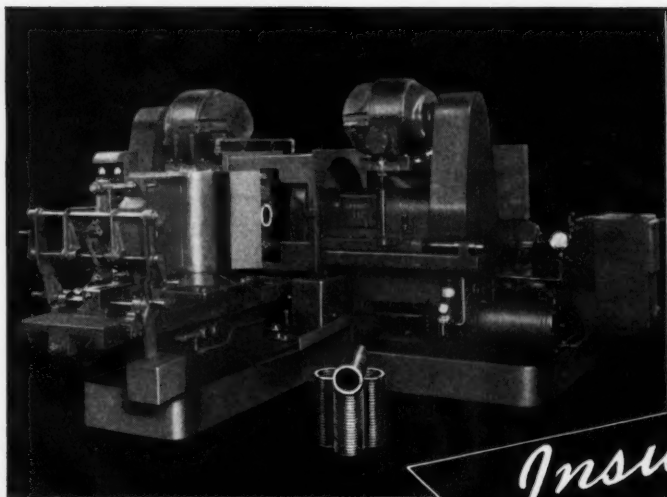
# THE STANDARD TOOL CO.

CLEVELAND

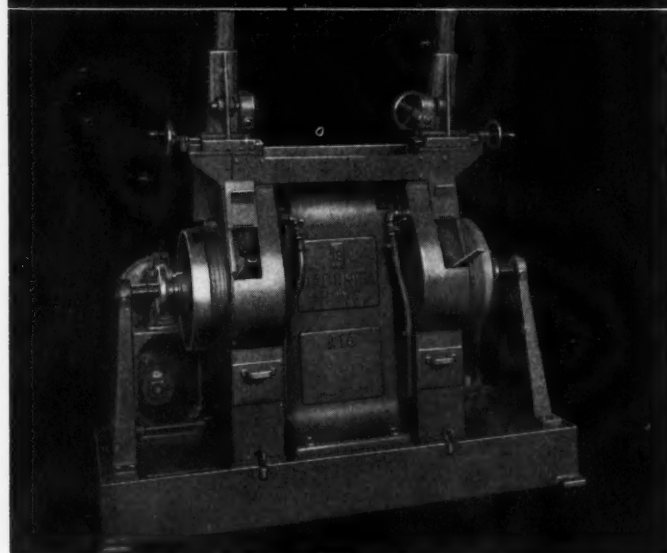
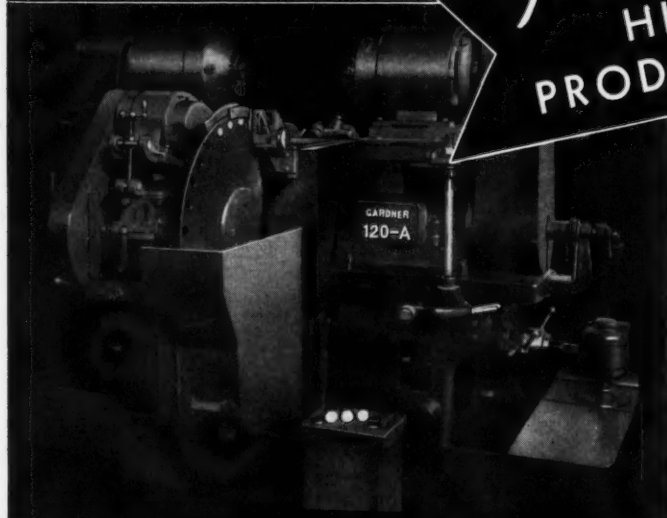
NEW YORK STORE  
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6533 HAMILTON AVE.

CHICAGO STORE  
552 W. WASHINGTON BLVD.



*Insuring*  
HIGH  
PRODUCTION



on many WAR JOBS  
with

*Gardner-Grinding!*

**T**HAT'S what many shops are doing to-day on a wide variety of flat surfacing operations.

The aircraft piston-rings, the fragmentation bomb cages, the torpedo-fuses, the bullet cores, which are ground on the 4 special Gardner Grinders shown here, are only a few examples of important war jobs handled quickly — and ACCURATELY — thru GARDNER-GRINDING.

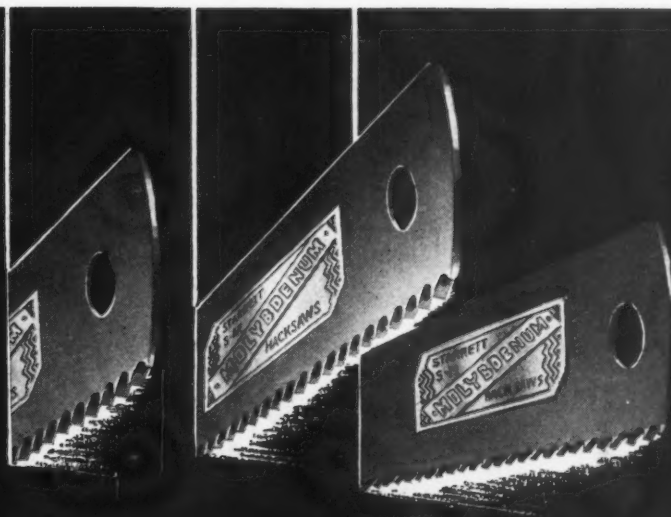
Call in GARDNER when you're obliged to turn out a flat-surface part in a hurry — a staff of experienced engineers is instantly available to solve your problem — and deliveries are getting better every day!

*And - you NEED complete data on GARDNER-GRINDING for your files - WRITE FOR IT!*



**GARDNER MACHINE COMPANY**

414 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.



## DAY BLADE

### When You Stick to STARRETT'S

STARRETT is a good name to look for—and to specify — on any blade, whether it's *Standard Steel* for hand sawing, *S-M Molybdenum* for hand or for light and heavy power sawing, or *High Speed Steel* for power sawing of extra hard alloys. Starrett standards of quality and uniformity have been steadfastly maintained. You can continue to count on blades carrying the Starrett name or label.

Ask your mill supply distributor for Starrett Hacksaws.



**THE L. S. STARRETT CO.**  
ATHOL, MASSACHUSETTS, U. S. A.  
*World's Greatest Toolmakers*

*Now, with  
Two Service Stars*

#### Announcing the New

#### STARRETT "SAFE-FLEX"



Class A, High-Speed Steel Hacksaw Blade with the *Flexible Back* and *Hard Edge*—a combination that's *virtually unbreakable*.

Try this new STARRETT "SAFE-FLEX" blade on hand-sawing jobs where the going is rough and the cutting is tough. It comes in 10 and 12 in. lengths, 14, 18, 24 and 32-tooth blades. Ask your mill supply distributor for STARRETT "SAFE-FLEX" Hand Hacksaw Blades.

STARRETT HACKSAWS



*True-fit  
Super-tough  
Socket*

**COLD-FORGED**  
to concentrate **STRENGTH**  
where strains are greatest

## PARKER-KALON SOCKET SCREWS

**P**ARKER-KALON rules out socket trouble. First — by *cold-forging* to concentrate dense, tough metal where the strains are greatest. Second — by unequalled Quality Control over all physical and mechanical characteristics.

P-K's Quality-Control routine starts when the raw material enters the Parker-Kalon plant, and continues until the finished screws are

packed. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Torsion and Shear; Hardness; Head and Socket Size and Position; Thread Fit.

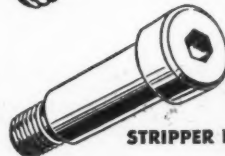
Socket Screw users need this protection today more than ever. Specify "Parker-Kalon" next time you order, it costs no more. Parker-Kalon Corp., 202 Varick St., New York 14, N. Y.



SET SCREWS



CAP SCREWS



STRIPPER BOLTS












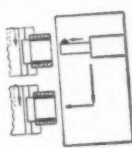

PIPE PLUGS

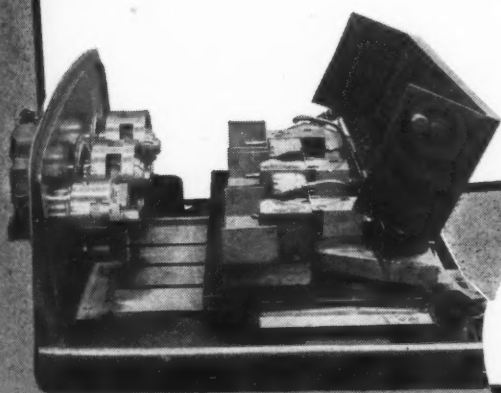
**A Product of PARKER-KALON--Specialists in Fastening Devices**

# Get Maximum Cutting Efficiency WITH VERSATILE HEALD BORE-MATICS

**\*V.F.3**

**FOR ALL JOBS—  
ALL OPERATIONS—  
ALL MATERIALS!**

Single-point tools  are extensively employed for boring operations on Heald Bore-Matics, cutting being done in a generated action. Broadnose tools  and form tools are also used, often in conjunction with single-point tools, tool action being plunge cut. In addition to these tools, drills  and reamers  also can be effectively employed. Tools can be rotated in a fixed sweep  by boring heads, can be rotated and simultaneously fed radially  by rotating tool slides or can be rotated with cam control for contour operations; tools also can be mounted in tool blocks on the table,  on cross-slides,  or on angular slides  for longitudinal tool travel, cross-feeding or angular movement. Cross-slides also provide means of indexing tools and tool retraction.  Still another possibility are rotary tool blocks  for spherical boring and turning. Any one of these tooling methods can be used separately or all of them can be combined for multiple operations on a single Bore-Matic. For more information, write...The Heald Machine Co., Worcester 6, Mass., U.S.A.



LOOK FOR  
**\*V.F.**  
"VERSATILITY FACTOR"  
in your Post War Tools

V. F. 1 — Application  
V. F. 2 — Function  
V. F. 3 — Tooling  
V. F. 4 — Fixtures

## \* THIS IS TOOLING VERSATILITY

Tooling of Heald Bore-Matics is specially designed to meet the specific requirements of each job. Versatile basic design makes possible almost limitless tooling combinations. Shown left is a Heald No. 47A Bore-Matic tooled up to drill, face, turn, chamfer and bore gear blanks.

# HEALD

## Bore-Matics

THE MOST VERSATILE MACHINE TOOL

# *Versatility — in a Cylindrical Lapper?*



## **GRINDERGRAM**

Never force a grinding wheel onto its sleeve. It should slide onto the sleeve freely and yet without undue looseness.



# *Yes-* THE NORTON SIMPLEX *has Adaptability!*

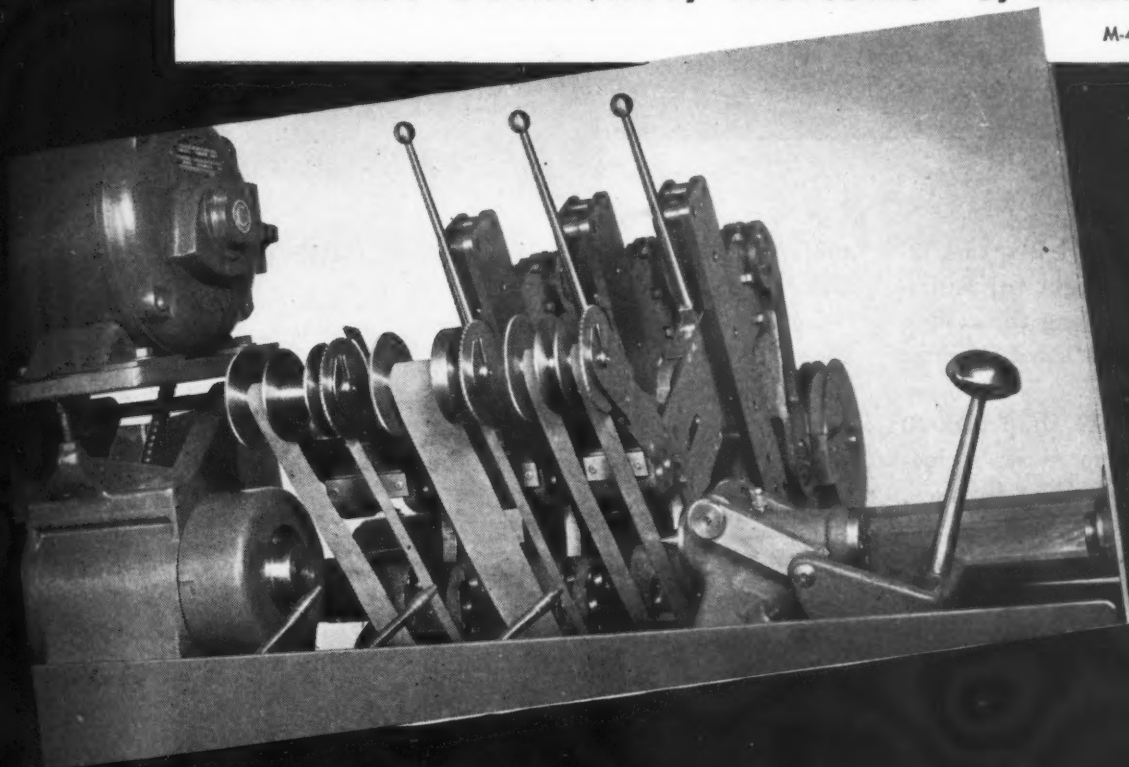
**I**MAGINE changing over a lapper from one job to another in a few minutes? It can be done with the new NORTON SIMPLEX LAPPER.

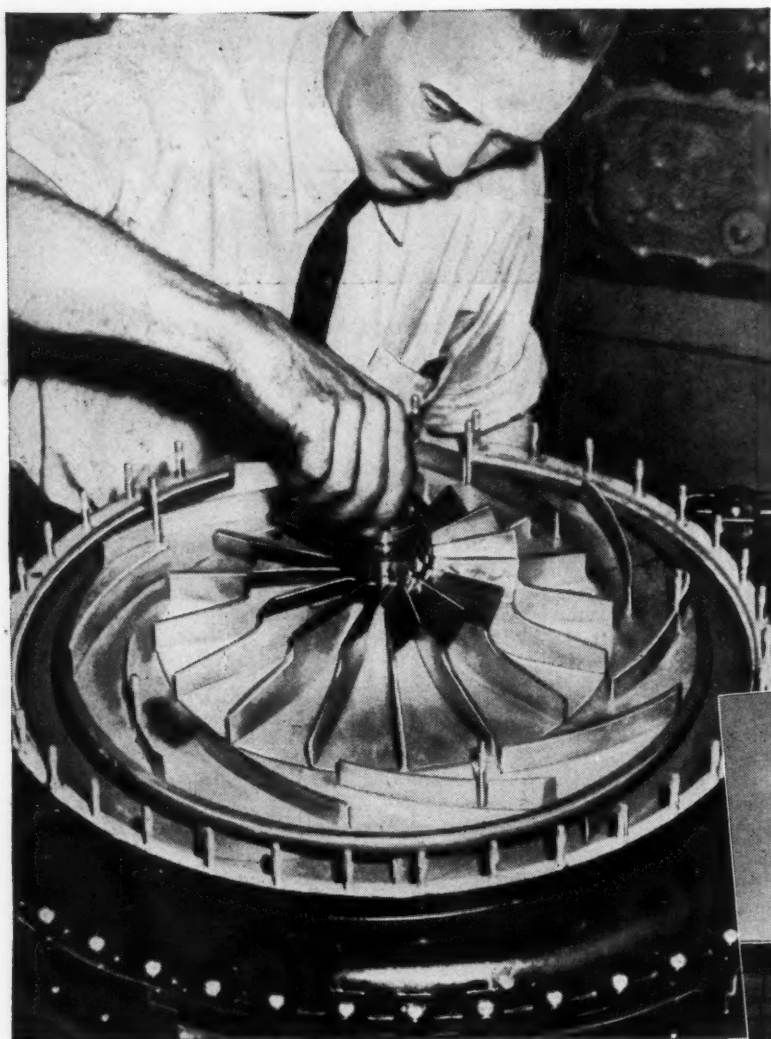
Here is a production machine reduced to its simplest form, yet a machine which will produce finishes of from five to one micro-inches R.M.S. on cylindrical surfaces.

It is particularly adapted to work on small trunions, journals, sleeves, bearings between shoulders, and other similar cylindrical surfaces. One, two, three, four, five, six and more surfaces may be finished simultaneously. In addition, short throw cranks and eccentrics are well within the range of the NORTON SIMPLEX. Timer cycle control and table reciprocation give fast, positive precision production in a machine built to Norton standards of craftsmanship.

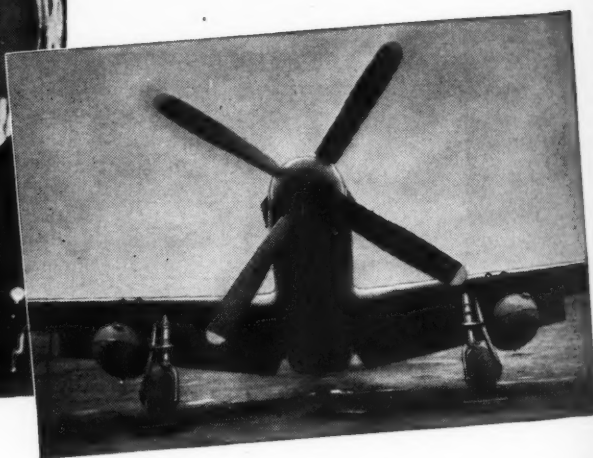
**NORTON COMPANY, Worcester 6, Mass.**

M-481





## LIFTING THE *Ceiling*



**T**HE new Packard 2-speed, 2-stage supercharger for Rolls-Royce engines is raising the ceiling of our latest P-51 Mustang fighter nearly 2 miles higher.

Spinning at more than 20,000 r.p.m., superchargers must be machined to the nth degree of accuracy. Doing this on a production basis requires the most suitable cutting coolants available. Whether for fine precision work or hogging off metal in the roughest of machining operations, machine-shops everywhere

prefer Texaco Cutting and Soluble Oils.

Texaco Cutting Oils permit higher speeds and feeds, with improved surface finish. They lubricate the tools, and by carrying away the heat prevent chip welding; and lengthen tool life, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 E. 42nd St., New York 17, N. Y.

### THEY PREFER TEXACO

- ★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.
- ★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
- ★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.
- ★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.
- ★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.



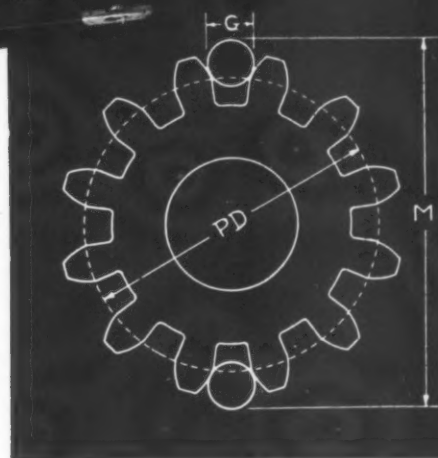
# TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT - CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Set No. 26 External  
Gear Measuring  
Wires for use with  
new simplified gear  
measuring system.



**SIMPLE  
RELIABLE  
SUPER-ACCURATE!**

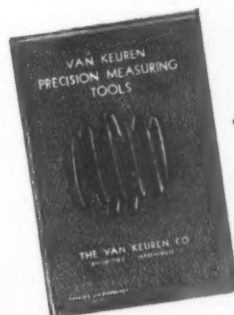


# *Van Keuren* GEAR MEASURING SYSTEM

**SIMPLE!** . . . The only calculation required is one of simple division.  
**Reliable!** . . . The system is based on formulas approved by the American  
Gear Manufacturers Association.

**SUPER-ACCURATE!** . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size. Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 10 to 171 teeth and for pressure angles of  $14\frac{1}{2}^{\circ}$ ,  $17\frac{1}{2}^{\circ}$ ,  $20^{\circ}$ , and  $30^{\circ}$ . The tables provide for measuring both external and internal gears. They are far more accurate than anything previously available. No interpolations are required. Write for catalog No. 32, giving full details, complete tables and instructions for their use.

Our Catalog No. 32 is a manual of precision measuring systems, giving complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Send for this valuable handbook!



**25<sup>th</sup> Year**





**This Pratt & Whitney Air-O-Limit Internal Comparator avoids actual contact . . . eliminates danger of scratches or marrings of fine finished surfaces . . . gives instant, accurate readings that split "tenths" . . . speeds up I.D. inspection rate.**

• • •

It was a tough problem. An airplane engine manufacturer needed a safe, sure way to inspect the critical I.D. of master-rod bearings. Ordinary gaging methods would touch the soft lead-indium plated inner surface . . . produce scratches that would spoil it for use.

The manufacturer asked Pratt & Whitney engineers, "Have you the answer?"

"No, but we'll find one." Result: the Air-O-Limit Internal Comparator . . . extremely simple in construction and operation . . . but it took the accumulated years of P&W "know-how" and experience and skill to produce it quickly.

Here's how it works. The bearing to be inspected is

placed on a sliding V-block mounting and slipped over the gaging spindle . . . there is a slight clearance so that it does not actually touch. This spindle has two tiny opposite nozzles through which compressed air is forced. The amount of back pressure caused by limiting the discharge of air through the nozzles is registered on a precision pressure indicator calibrated to read in ten-thousandths of an inch. Size, roundness, and taper are unerringly recorded.

This is the highly successful Air-O-Limit Bearing Gage. Other Air-O-Limit models use the same "air principle" but omit the non-touching feature. The piece slips on the spindle and rests on a chrome-plated surface. Hundreds of this type are at work inspecting fine tolerance parts. They require practically no up-keep or servicing . . . are designed for long wear.

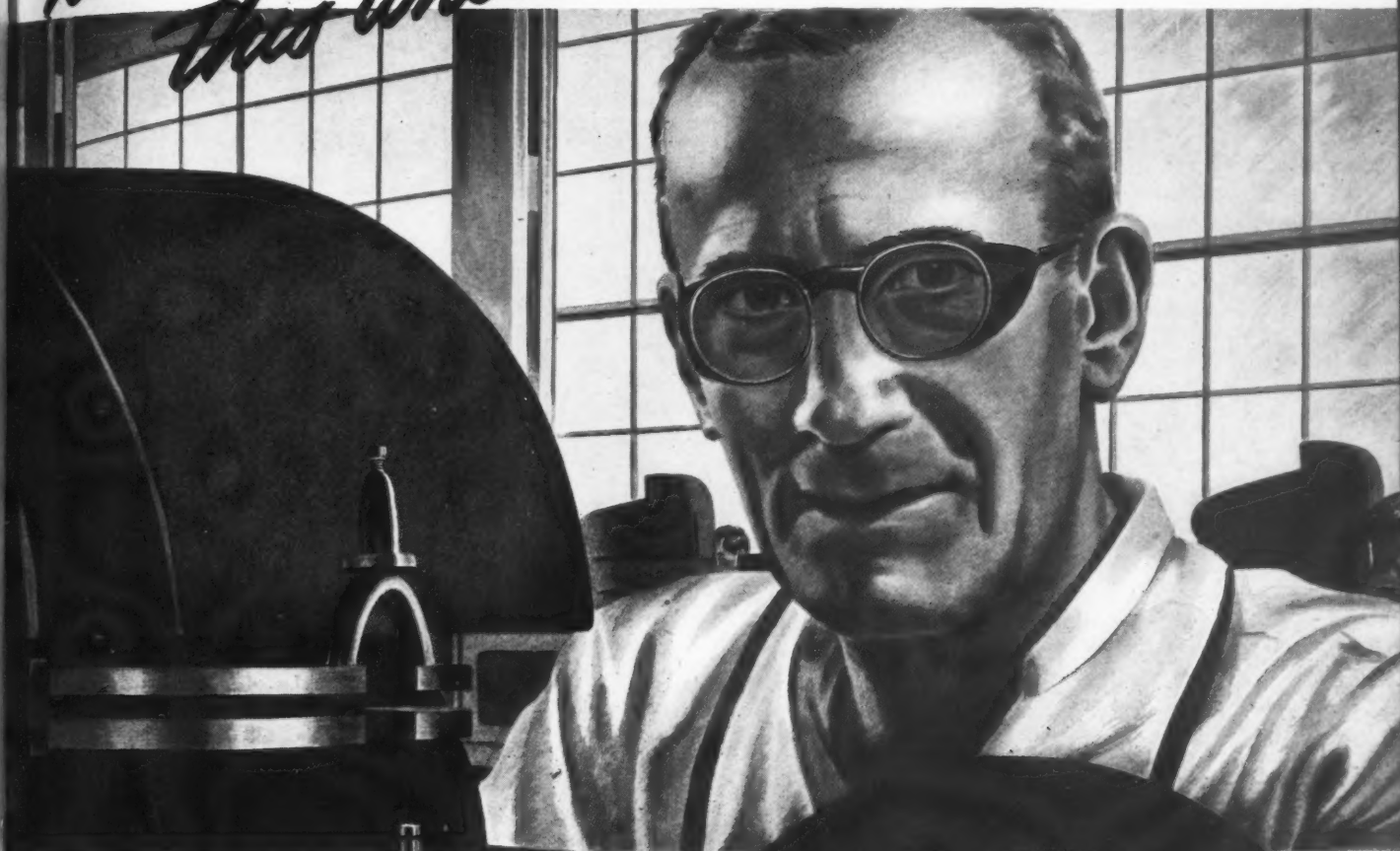
One more typical Pratt & Whitney contribution to the speeding up of America's mighty war production . . . one more contribution to peacetime mass production. Ask for information.



# PRATT & WHITNEY

*"We don't  
have to 'baby'  
this wheel!"*

"One of our jobs is grinding hardened high speed steel punch blanks. We used to take off .006" at a pass and congratulate ourselves. Now Por-os-way removes .020" at a clip... without loading or burning. Holds its corner and requires no dressing. It's one wheel we don't have to 'baby'." Try Por-os-way yourself and for production's sake don't baby it. Don't be satisfied until you've pushed the Por-os-way wheel to the utter limit of its possibilities. Send today for the booklet "Facts about Por-os-way"—with the prescription blank. Then order a trial wheel and TRY it!



#### CHIP CLEARANCE—AN EXTRA ADVANTAGE

Taps have it! Cutting tools have it! It's chip clearance! The very porous structure of the Por-os-way wheel provides chip clearance NATURALLY so material can be removed without interfering with the tiny grinding edges. Proved by long, curling chips. Reflected in the greatly reduced need for dressing.



#### THIS MAKES THE DIFFERENCE—

You can spot the difference between an ordinary wheel (top) and a Por-os-way wheel (bottom) with the naked eye. The extra porosity of Por-os-way is the reason for more than 8 distinct operating advantages.



**2 TO 5 TIMES**  
MORE PRODUCTION  
PER MAN PER MACHINE

\*T. M. Reg. U. S. Pat. Off.  
Copyright, 1944, A. P. de Sanno & Son, Inc.

**RADIAC\***  
**POR-OS-WAY\***

A. P. DE SANNO & SON, INC., 428 Wheatland St., Phoenixville, Pa., Since 1893

NEW YORK, PITTSBURGH, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

Radiac POR-OS-WAY • Radiac PARAFLEX • Radiac Mounted Points and Mounted Wheels  
Radiac Internal Grinding Wheels • Radiac Abrasive Cut-Off Machines and Discs



...the open  
...And yet the same  
...which can be used for rough  
grinding as... ending time wasted in  
wheel changes and additional finishing steps.

**The List of Por-os-way Users Reads Like a Blue Book  
of American Industry, Included are:**

Edward G. Budd Mfg. Co. • Buick Motor Division of General  
Motors • Curtiss-Wright • Douglas Aircraft • SKF Industries  
• Studebaker Corporation • Timken Roller Bearings • Wadell  
Engineering Co. • Westinghouse Electric • Wright Aeronautical



# RADIAC\*

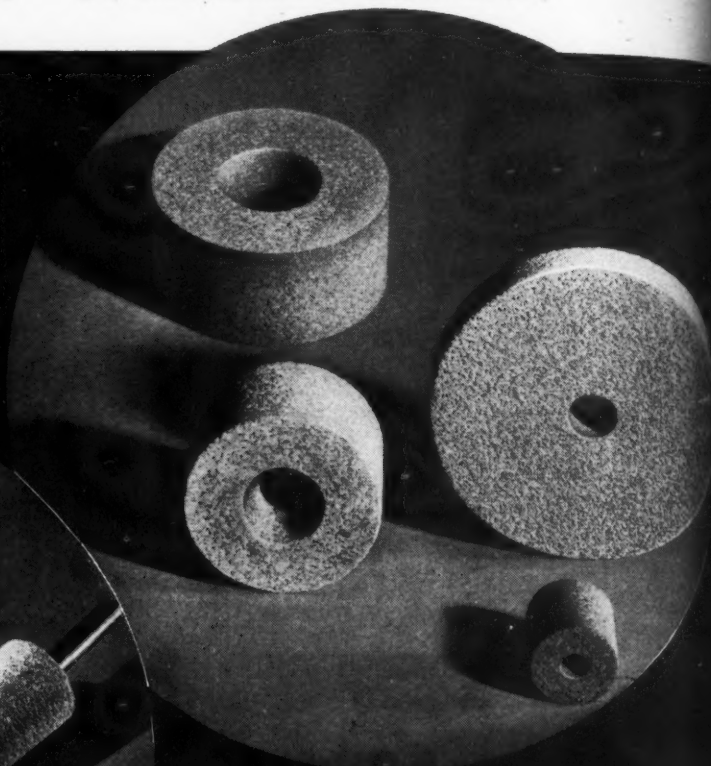
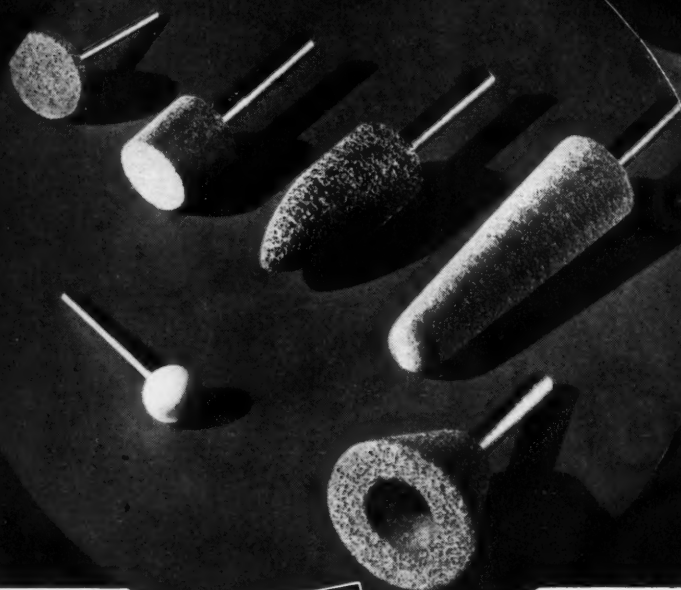
Take advantage of Prescription-Fitting and Custom-Compounding when you buy mounted points, mounted wheels and internal grinding wheels.

It's virtually impossible to go wrong with Radiac service. First of all, the wheel is selected for your individual job by a "prescription-fitting". Then it is specially "custom-compounded." But that is not all. The "prescription" is filed by us so that re-

peat orders can be quickly and accurately filled. Radiac gives you the right wheel the first time and every time! Write for booklet with complete details on Internal Grinding Wheels (booklet #1) and Mounted Points (booklet #2).

## RADIAC MOUNTED POINTS & MOUNTED WHEELS

All wheels and points are dressed and finished ready to use (no finishing, by you necessary) • All kiln glaze is removed • All are 100% tested to precision tolerances • Concentricity is guaranteed • Special Bakelite cement secures wheel to mandrels • Radiac Mounted Points and Mounted Wheels are available in tough, regular aluminum oxide (brown) or in special aluminum oxide (white or red bond) for greater friability.



## RADIAC INTERNAL GRINDING WHEELS

All wheels are 100% tested to precision tolerances • Every wheel is a product of pioneers in the development of internal grinding wheels • Radiac Internal Grinding Wheels are available in tough, regular aluminum oxide (brown); in special aluminum oxide (white or red bond) or a special exclusive "Blue Glass" friable bond which permits an increase in the ratio of cutting grain to bond

## PIONEERS

in the development of mounted points, mounted wheels, and internal grinding wheels.

Radiac POR-OS-WAY—Radiac PARAFLEX—Radiac Mounted Points and Mounted Wheels—Radiac Internal Grinding Wheels—Radiac Abrasive Cut-Off Machines and Discs.

\*T.M. Reg. U.S. Pat. Off.

For Fast Stock Removal, Long Life, Cool Cutting—

# RADIAC\*

A. P. DE SANNO & SON, INC., 428 Wheatland Street, Phoenixville, Penna., Since 1893

NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • LOS ANGELES

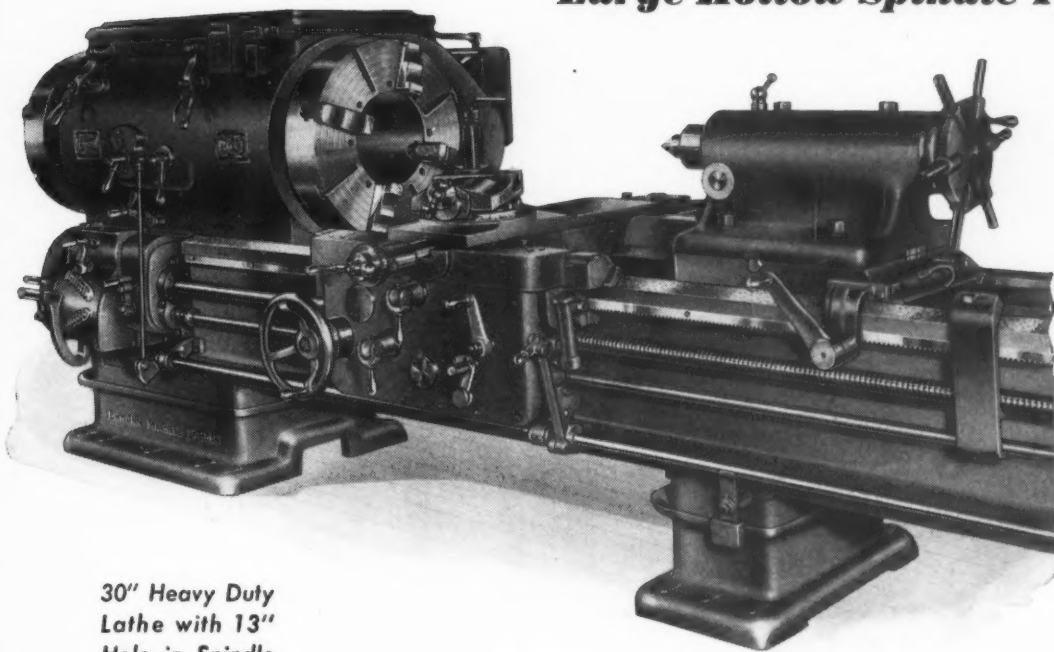


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**I Can Sure Do a  
BETTER JOB on a  
Hydratrol Lathe!**

**Large Hollow Spindle Type**



30" Heavy Duty  
Lathe with 13"  
Hole in Spindle

# Hydratrol Lathes

**LARGE HOLLOW SPINDLE TYPE**

**I**N hundreds of plants—under all sorts of conditions—HYDRATROL LATHES (Large Hollow Spindle Type), are doing a better job than had ever been done before. Invariably they are increasing production, improving work, cutting costs.

The chances are that YOU can "do it better" on a HYDRATROL LATHE. Why not send us prints of your difficult, unusual or too-costly

machining jobs, for a specific, time-and-money-saving recommendation.

## Complete Line of Sizes from 18" to 36"

Small	.....18" up to 7 1/4" Hole
Medium	.....24" up to 12" Hole
Large	.....27" up to 13" Hole
Large	.....30" up to 14" Hole
Large	.....36" up to 16 1/2" Hole

(Standard Type lathes, 16" to 36")

**Lehmann MACHINE COMPANY**

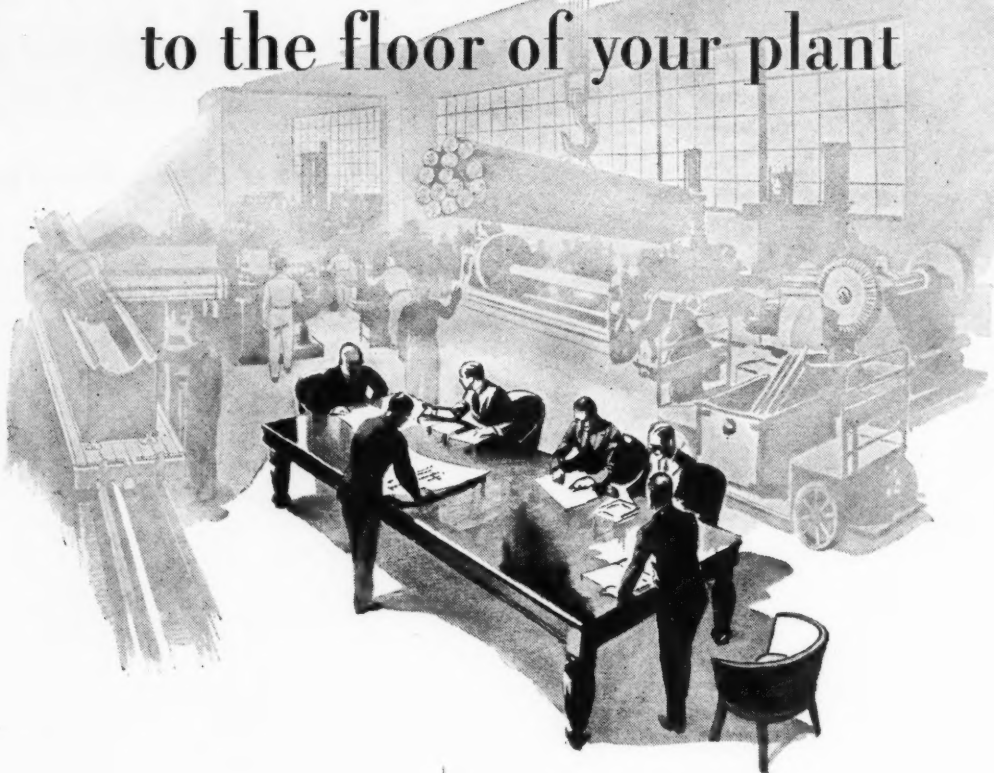
CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

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\*

# Move your post-war planning committee to the floor of your plant



Not literally, of course, but objectively. For there on the floor of your plant is the nucleus of the equipment on which your reconversion to consumer goods production will depend.

Few of the plans you conceive so carefully will have real meaning unless you take "physical inventory" of the condition of your present machine tools...unless you estimate how the stress of war production has impaired the efficiency of even those tools which were new just a few short years ago...take the first steps to restore their maximum efficiency and make them equal to their post-war job.

Reconversion-minded management in many of the country's leading plants are taking similar tours and initiating systematic programs of *Engineered Rebuilding* by Simmons Machine Tool Corporation.

For Simmons engineers bring to a rebuilding problem thirty-five years of specialized experience with every type and size of machine tool. Their proven techniques are behind the assurance that prematurely old machines

can be restored to their original efficiency or new utility "built-in" beyond the originally designed intent.

Simmons methods have converted planers into hydraulic grinders, doubled the capacity of planers, converted entire plants from belt-driven tools to individual, self-contained motor driven units, lengthened beds and tables, widened housings and provided special motors and gear transmissions and other labor-saving devices.

*Engineered Rebuilding* can play a major part in setting up your new production line. And it's not too early to add it to your reconversion "musts." Start today by sending us a list of the machines you need rebuilt... those which can be "furloughed" from their war production jobs. We'll show you how "The Simmons Way" can facilitate your program.

  
President

**SIMMONS MACHINE TOOL CORPORATION**  
1600 NORTH BROADWAY, ALBANY 1, NEW YORK

## **SIMMONS *Engineered* REBUILDING**

# MIGHTY MIDGETS OF 6-6-2

... doing a Victorious Job!

Sharp-toothed, high-speed rotary files and burrs  
... tools serving aircraft, surgical, shipbuilding  
and small arms plants at vital points in pro-  
duction ... tools that stay sharp longer.  
Pulaski Metal Products Co., Pulaski, N.Y.,  
uses 6-6-2 for these mighty midgets.  
Other manufacturers are finding  
E.V.M. and Red Cut Superior per-  
formance-worthy too ... all in  
the VASCO family!

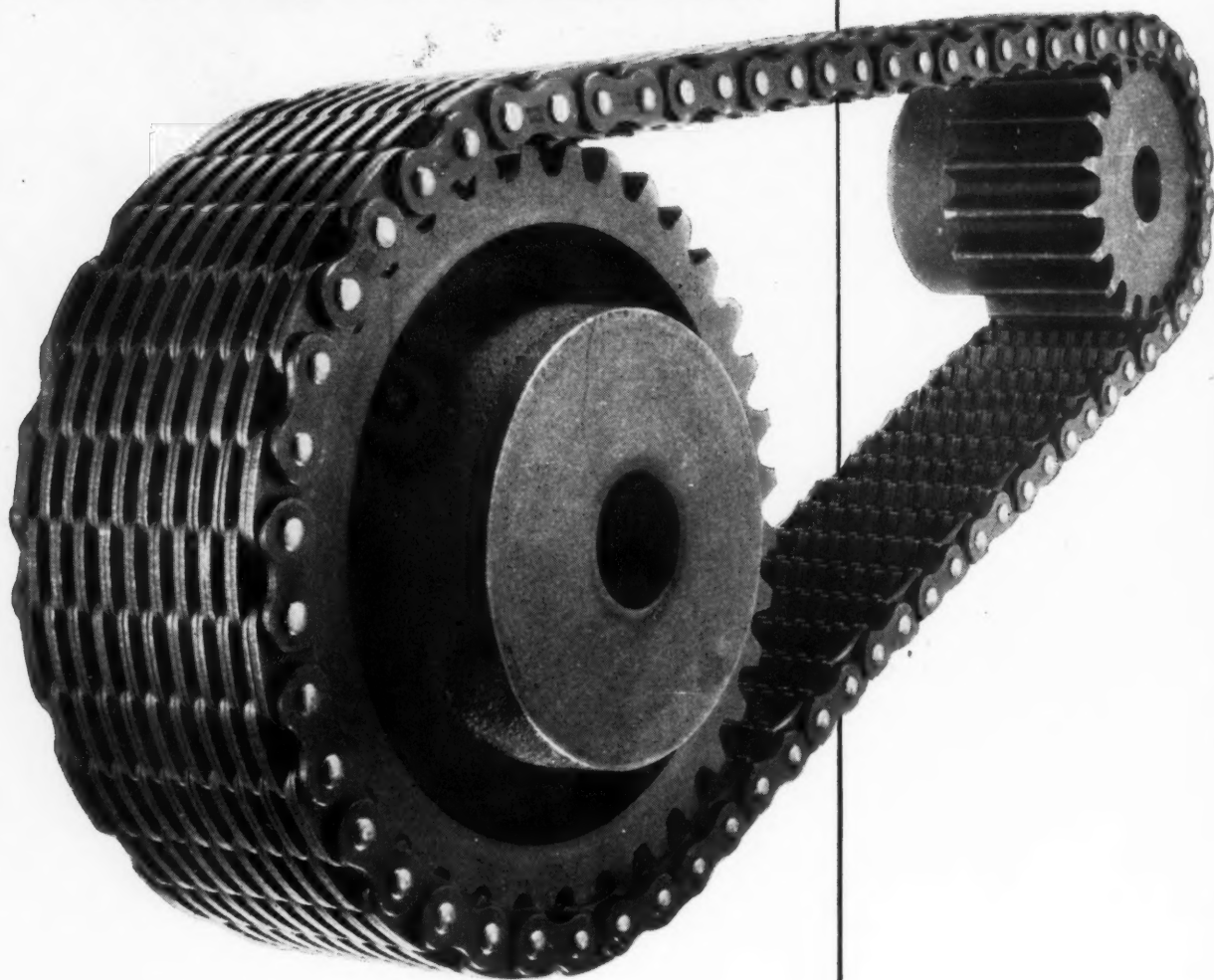


STEEL CO. LATROBE, PA.



# ALL QUIET

*on the Operating & Maintenance Fronts*



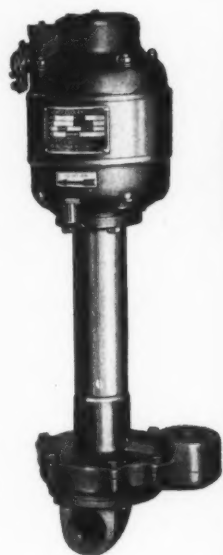
**with WHITNEY SILENT CHAINS**

It's only half the story, to say that these Whitney Chain Drives are *silent* in operation. They're equally silent in another way . . . make no frequent calls for maintenance and adjustments. For extra strength and *extra life* are built into Whitney Chains first by alloy-armored steels . . . then by Whitney's exclusive double-bearing design which distributes the load over 50%

greater area, both on the inside and outside of the chain bushing. This means extra margin of resistance to shocks and overloads, greater stamina to stand up under non-stop operation in war production factories. That's why Whitney Silent Chains have been standard for years...and why so many war plants specify "Whitney." Give your war production machines this proven dependability. Make Whitney Silent Chains your "all-out" drives for Victory.

**THE WHITNEY CHAIN & MFG. CO., HARTFORD 2, CONN.**

# Save

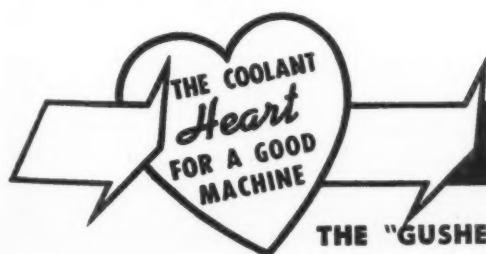


Gusher Coolant Pumps are helping to maintain the efficiency of machines operating twenty-four hours a day . . . supplying a copious, steady, controllable flow of coolant for multiple cuts, for precision operations of all kinds.

Leading builders of every type of machine tool have chosen Gusher Pumps as standard equipment. These are the features that have earned Gushers their popularity: Automatic priming gives split-second delivery of coolant in exactly the volume desired. Throttling decreases the power consumed. No friction or binding, because packing nut, foot and relief valves are eliminated. No metal-to-metal contact, thus making continuous handling of grinding compounds possible. Complete line covers all coolant needs. Send for details.

**A FEW TYPES OF "GUSHER" PUMPS FROM OUR COMPLETE LINE. Reading from top, counter-clockwise:**

1. Intake and discharge through flange separately.
2. Horizontal ell intake at bottom with vertical discharge.
3. Side intake with vertical discharge.
4. Twin intake with horizontal discharge.
5. Plain immersed type with vertical discharge.



## GUSHER COOLANT PUMPS

THE "GUSHER"—A MODERN PUMP FOR MODERN MACHINE TOOLS

MACHINERY, August, 1944—121



Here is a prong-type ring gage, small enough to fit into the palm of the hand. With tooth thickness of less than  $\frac{1}{16}$ ", the sixteen teeth are so accurately spaced that the master setting plug, which is .0001" smaller in over-all dimension, will enter the ring at any tooth engagement—proof that the COMBINED ERROR in spacing, parallelism and centrality of teeth IN BOTH PARTS cannot exceed .0002". A good gage is mechanically exact. Vinco makes good gages.

**VINCO CORPORATION, 8853 SCHAEFER HIGHWAY, DETROIT 27, MICH.**  
**SALES OFFICES—** **NEW YORK** **CLEVELAND** **CHICAGO**

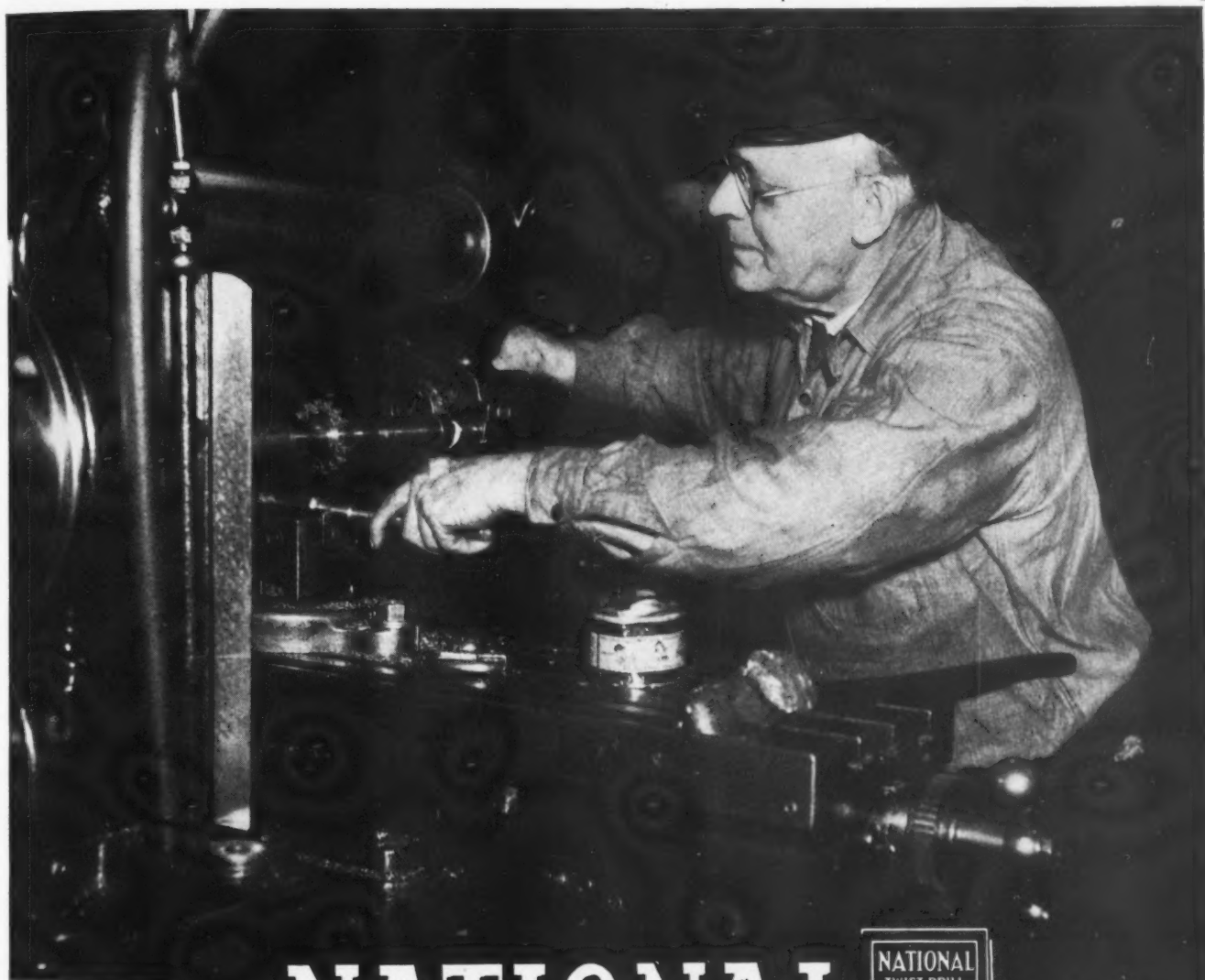
**MILLIONTHS OF AN INCH FOR SALE BY VINCO**

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser  
 • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread  
 Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear  
 Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.



# HANDLE WITH CARE!

Hardened tools are tough—but cutting edges are brittle. Hammering them onto arbors or into tool holders can be as harmful as dropping them on machine tables or concrete floors. Until the last shot is fired, tools are weapons. Treat 'em right!



## NATIONAL



TWIST DRILL AND TOOL COMPANY  
DETROIT AND ROCHESTER, MICHIGAN

*National cutting tools, sold by leading Mill Supply Distributors, are tools of character.*

**DEPENDABLE**

TOOLS ARE WEAPONS - TREAT 'EM RIGHT!

# MORSE

**TWIST DRILL AND  
MACHINE COMPANY**  
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - CHICAGO STORE: 570 WEST RANDOLPH ST.  
SAN FRANCISCO STORE: 1180 FOLSOM ST.

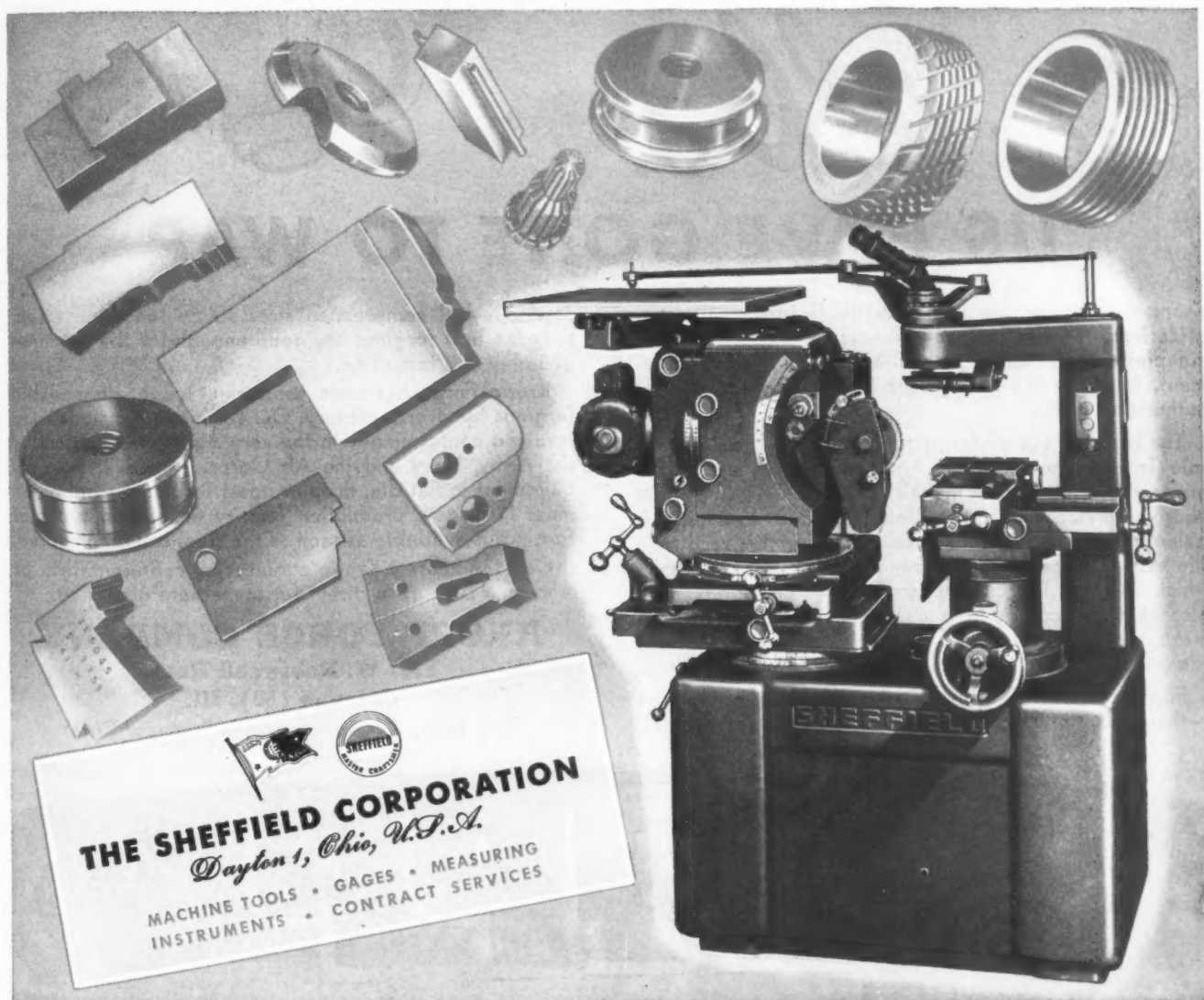
# *The* **SHEFFIELD** **MICRO-FORM** **GRINDER**

**PRODUCES  
PRECISION PROFILES**

*Faster* **AND AT**  
*Lower Cost*

1. No templates required
2. Produces profiles with time saving up to 75%
3. Work is checked without removing from machine
4. Uses standard inexpensive wheels
5. Wheels require no special dressing

Grinds materials of any hardness including tungsten carbide.  
Produces forms to an accuracy of .0003".







## NOT *all* OF US HAVE GONE TO WAR

Kropp forgings are becoming available for essential applications as—one by one—our war assignments reach completion and the list of civilian machinery and equipment, to which the green light is given by the federal authorities, grows.

The broader use of forgings has played an important role in the superiority of American planes and other armament—outstanding in their ability to carry on despite abusive service and punishment. Naturally, this trend is being carried into civilian products. Designers recognize the value of the ultimate strength and stress resistance which only the forging process bestows on metal parts; also that the competitive conditions of tomorrow will make it essential for machinery to provide greater service life per dollar of metal cost. That means more forgings.

Forgings get the hard jobs in every piece of equipment—they are the parts which must withstand torsional,

torsional and compression stresses. By the same token, only the best forgings are good enough for the machines of today and tomorrow.

Kropp Forge has been producing tough, dependable forgings for over a century. Our recent assignments have involved conforming with the very rigid specifications of the Army, Navy and the Air Corps. Whatever your requirement in flat die, drop or upset forgings—Kropp can meet it. Today, production facility on certain types of forgings is available as soon as the steel can be procured.

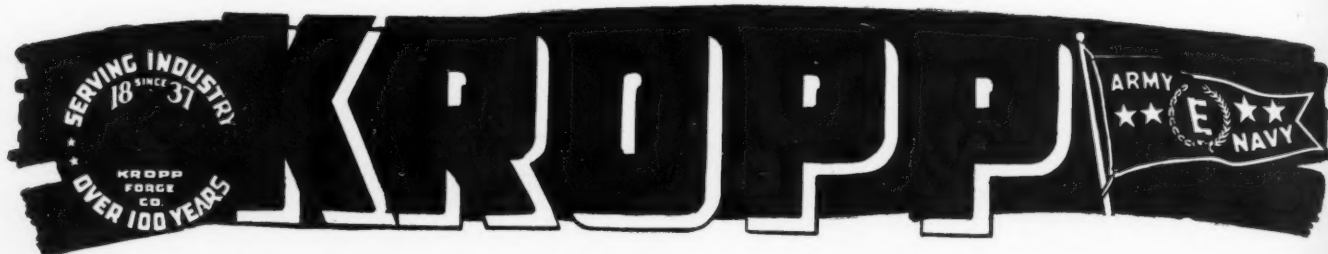
Call the nearest Kropp engineering representative, or send your blueprints direct for immediate quotation.

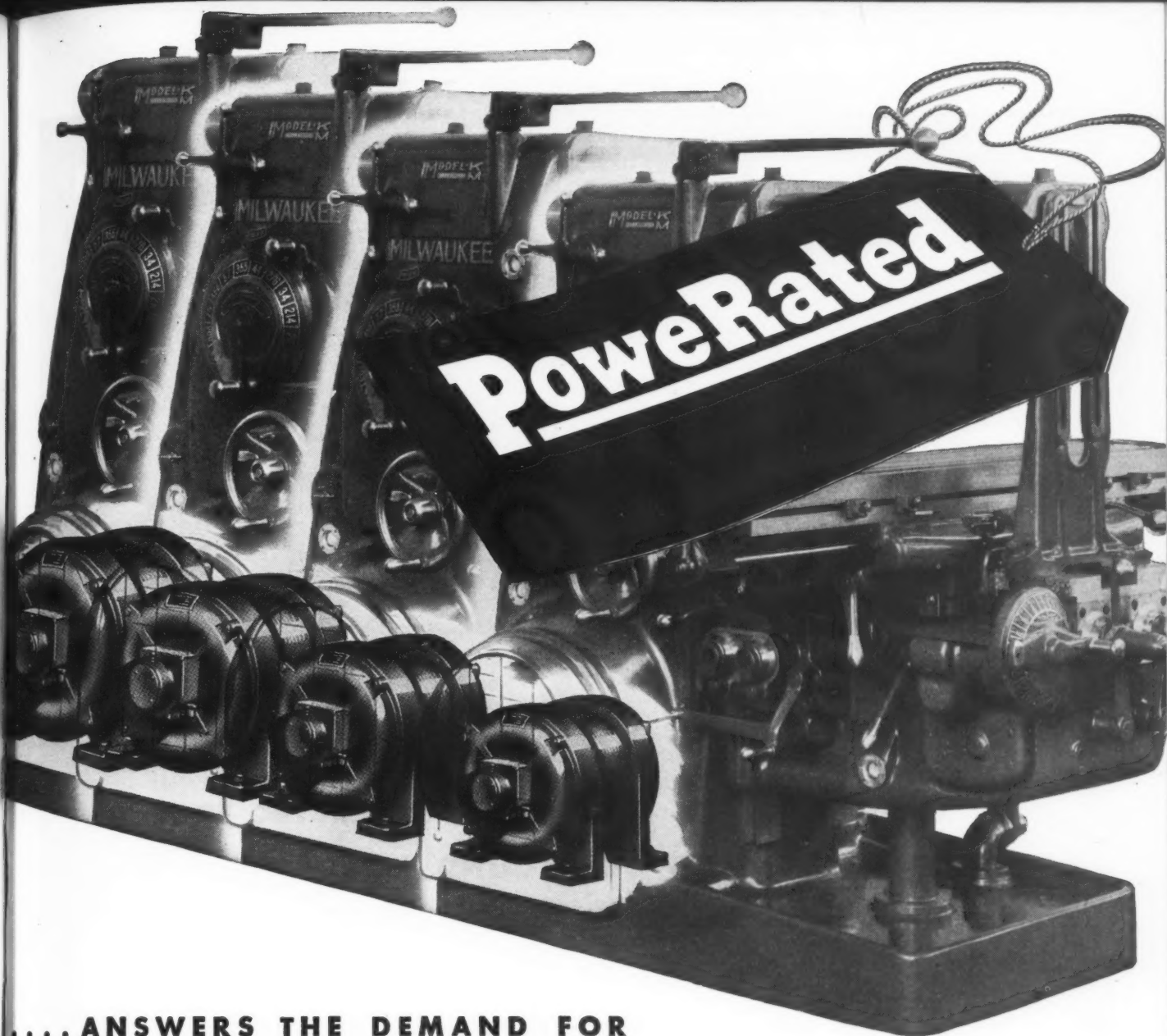
### **KROPP FORGE COMPANY**

5301 W. Roosevelt Road

Chicago (50), Ill.

Engineering Representatives in Principal Cities





.... ANSWERS THE DEMAND FOR  
MILLING MACHINES DESIGNED IN  
TERMS OF CORRECT MOTOR POWER

More than ever before, motor hp. is the number one factor — the starting point when purchasing milling equipment. Range is important, of course, particularly with milling machines for light cuts, but motor hp. of ample rating is the first consideration wherever heavy cuts are involved.

Since motor hp. is of such basic importance the substitution of a higher hp. motor above that of the motor normally specified for a No. 2 Milling Machine — to gain power and speed — is unsound practice because the power is excessive and out of balance with the design and construction of a No. 2 Machine.

Milwaukee Milling Machines are power-engineered — *PowerRated* — designed and built in keeping with their hp. range plus the normal overloads encountered within their field of job application. You can always be sure of the correct motor power in every Milwaukee.

The next time you need milling equipment, think in terms of motor hp. for heavy cuts — range for light cuts — and check with a Kearney & Trecker field engineer in deciding which *PowerRated* Milwaukee is best suited to your specific needs.

**PowerRated — Means Every  
Milwaukee Is Power —  
Engineered To Do The Job**

● **MILWAUKEE PowerRated MILLING  
MACHINES**

- Standard Models—Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.
- C.S.M. (Carbide Steel Milling) machines 20 to 50 HP.
- Special Machines — Consult K&T engineers.



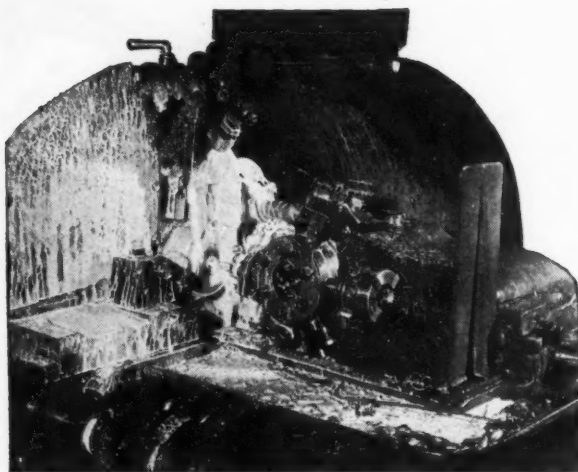
**KEARNEY & TRECKER**  
CORPORATION

MILWAUKEE 14

WISCONSIN

**BACK THE ATTACK... BUY MORE BONDS**

*Milwaukee Machine Tools*



*Let Your Production Records  
Prove Our Claim...* **PERFECTED LUBE-  
WELL CUTTING COMPOUND WILL SHOW A  
PRODUCTION INCREASE PER MACHINE UP TO  
25% REGARDLESS OF THE MACHINING OPER-  
ATION OR THE MACHINE TOOL BEING USED.**

To prove with your figures, on your work, in your plant, that this statement is founded in fact, G. Whitfield Richards will ship you any quantity of Perfected Lubewell Cutting Compound. You will find that it will 1. Increase machine production up to 25%; 2. Increase tool life up to 50%; 3. Give a superior finish and closer tolerances; 4. Lower cutting lubricant cost as much as 40%. We stand ready to prove this claim without obligation. Perfected Lubewell costs from 3 to 9 cents per gallon in the machine. Write today.



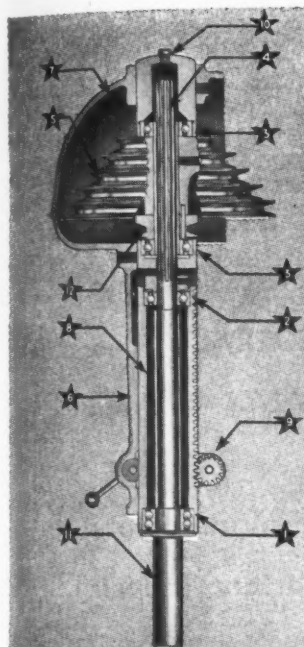
**G. WHITFIELD RICHARDS**

**PIONEERS OF** *Water Soluble Cutting and Drawing Lubricants*

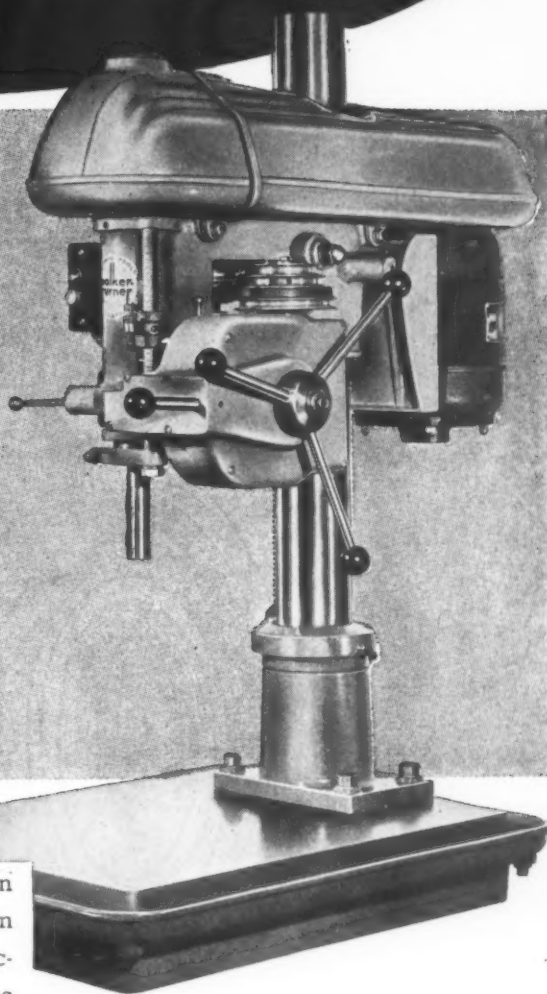
1736 CARLTON STREET • PHILADELPHIA 3, PA.



# Why Industry Prefers THE WALKER-TURNER 20" DRILL PRESS!



- 1 Double row ball bearing — for thrust and radial load.
- 2 Ball bearing near spigle center aids rigidity.
- 3 Ball bearings above and below pulley eliminates whip.
- 4 Ten spline spindle improves accuracy.
- 5 Aluminum alloy spindle pulley permits speeds above 5000 r.p.m.
- 6 One piece head casting, bored in line.
- 7 Pulleys and belt amply guarded, yet easily available.
- 8 Steel quill turned from bar, seats bored and rack milled in quill.
- 9 One piece feed pinion and shaft, with teeth cut on gear hobber.
- 10 One-shot lubrication — oil applied at one point only.
- 11 No. 2 Morse Taper Spindle Nose.
- 12 Power feed take-off pulley. Feed coordinated with spindle speed.



The sectional view above illustrates the careful design that provides an unusually smooth-running spindle in Walker-Turner 20" Drill Presses. These rugged production machine tools are in use in great numbers in war industries today. Due to their versatility, many have been applied in special tooling set-ups of various kinds. Simplicity of controls permits their use by unskilled and semi-skilled labor — an important point under present conditions as well as in the post-war period.

*Send for descriptive literature*

**WALKER-TURNER CO., INC., 1824 Berckman Street, PLAINFIELD, N. J.**

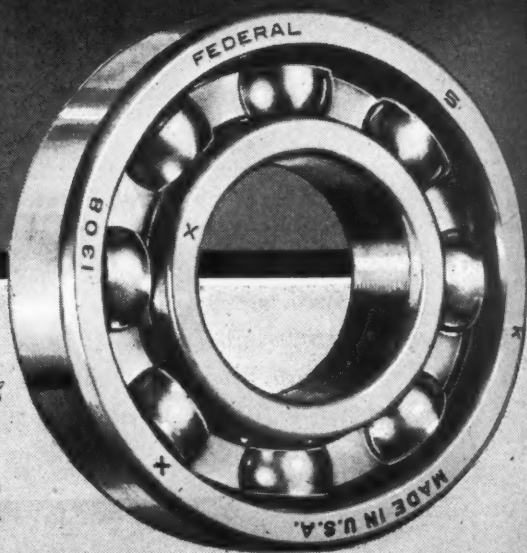
Furnished in bench, floor and multi-spindle models — with or without power feed. Capacity  $\frac{3}{4}$ " in steel, 1" in cast iron. Spindle speeds 260 to 2600 r.p.m.

# FEDERAL

## BALL BEARINGS



This famous trade-mark . . . an eagle and ball bearing . . . has always been associated with the name "FEDERAL". It is a symbol of QUALITY . . . a mark of distinction . . . familiar to engineers and manufacturers in every important industry.



THE FEDERAL BEARINGS CO., INC.

*Makers of Fine Ball Bearings*

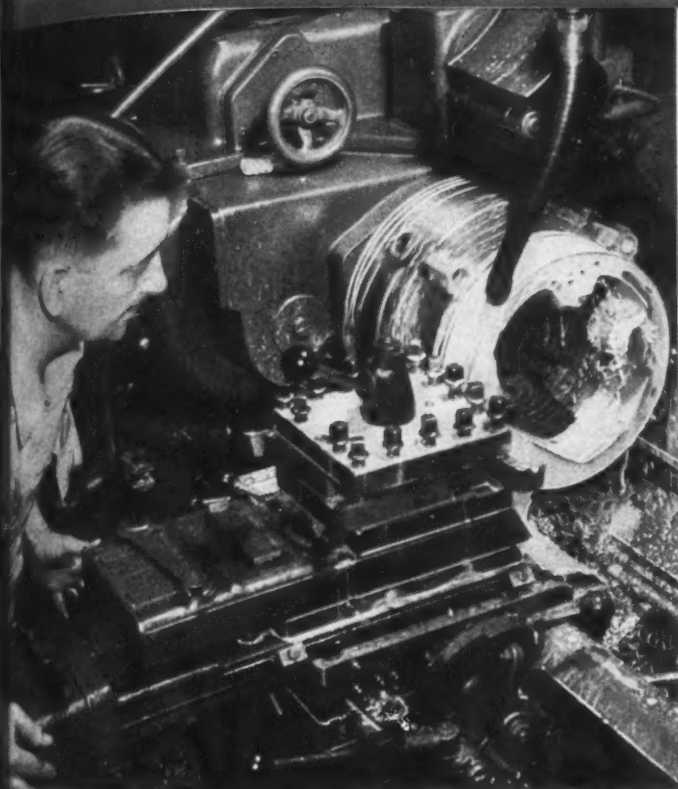
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

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## If It's a Warner & Swasey, it's a HIGH PRODUCTION PRECISION MACHINE

**W**ARNER & SWASEY, for many years builders exclusively of turret lathes and turret lathe tools, has added a line of precision tapping and threading machines.

There's a sound reason for this step. Emphasis throughout this war period is big volume production of machined parts produced at high speed and held to unusually close tolerances. Greater accuracy in internal and external thread cutting has been demanded by Army and Navy for war materiel. The demand for quantity production and closer machining limits will carry over in postwar manufacture of civilian goods.

Tapping and threading are often the last operations on a part which has undergone a sequence of high precision operations. A reject of the piece

because of thread deficiencies means the loss of time, critical materials, and the skilled effort that has gone before.

The Warner & Swasey Precision Tapping and Threading Machine introduces a new principle which enables average operators to produce class 3, 4, and 5 gage thread fits at faster rate with remarkably low percentage of rejects and virtually no breakage of taps.

It will pay every manufacturer of precision threaded parts in hard or soft metals, or plastics, to learn the full possibilities of this radically improved method. See your Warner & Swasey field representative or write for a catalog describing models with tap capacities from an 0-80 to a 1½" tap.

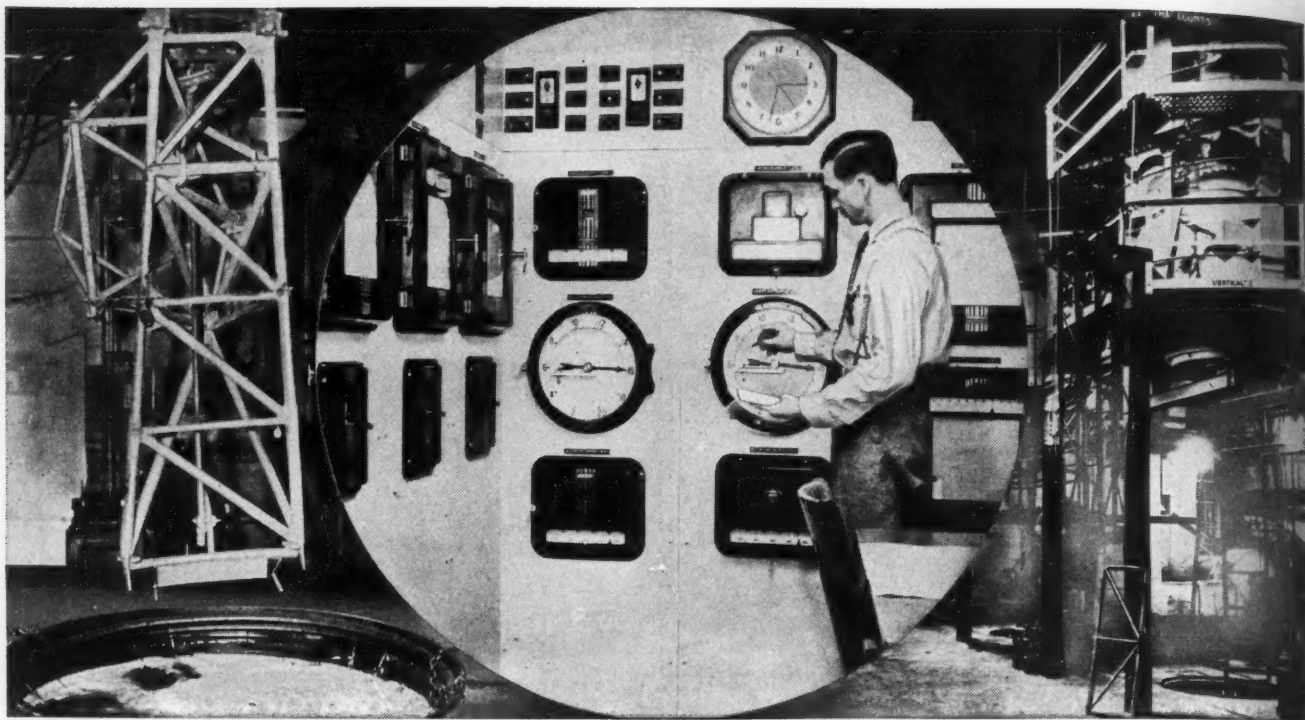
*Your Warner & Swasey representative can also tell you about many new accessories now available, which can make your Warner & Swasey Turret Lathe still more productive.*

**YOU CAN MACHINE IT BETTER, FASTER, FOR LESS...WITH  
A WARNER & SWASEY**



TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES





Jigged to prevent distortion, this welded member for the nacelle of a Beechcraft plane plunges from its Micromax-controlled vertical furnace into oil quench. Quenching is complete in 5 to 8 seconds.

Beech Aircraft's centralized control room in which are located the Micromax Pyrometers to regulate all heat-treating temperatures. The foreman is consulting the Pyrometer for the vertical nacelle-furnaces.

One of the Micromax-regulated furnaces in which nacelle elements are heated. These furnaces are gas-fired, full muffle, atmosphere-controlled; are specially designed to Beech's needs.

## BEECH INCREASES HEAT-TREAT EFFICIENCY By Centralizing Its Micromax Controllers

Heat-treating operations performed in the Beech Aircraft Corp. plant at Wichita, Kansas, include case hardening, annealing, normalizing, stress-relieving, hardening, etc. The job of automatically controlling the temperatures of these operations has been turned over to Micromax Pyrometers, with the result that their micro-responsive control is giving Beech routinely dependable heat-treatment.

For utmost efficiency, instruments are centralized in a specially-designed control room. Here all Micromax Controllers have the same ambient temperatures; all operating conditions are standardized; one man keeps all temperatures under his eye. The room is supplied with air at a slight positive pressure so that dust and fumes cannot enter—a valuable time-saver when pyrometers, hardness testers and other instruments are to be kept at optimum accuracy and dependability.

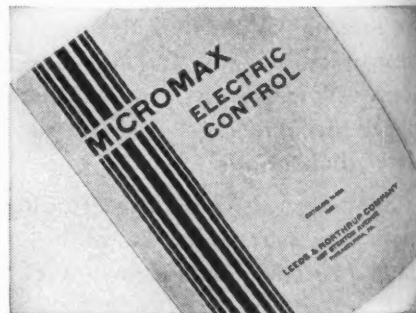
### Instrumentation of Vertical Furnaces

Typical of the special equipment employed is that for airplane nacelles. These are hardened in vertical furnaces, set well up in the air and directly above the quench tanks. The furnaces are muffle units, gas fired and supplied with specially prepared atmosphere to prevent oxidation or other change of the plane parts. Nacelles are quenched through doors in the furnace bottoms.

These furnaces have three firing zones, each with its Micromax Controller. In the round picture above, one group of three Controllers can be seen directly below the clock; the top and bottom instruments, on the first and third zones, are Indicating Controllers, while the middle zone has the Recording Controller which the foreman is examining.

These instruments bring micro-responsiveness to temperature regulation, so that almost simultaneously

with the appearance of heat lags or surges, the fuel valves are adjusted to bring temperature back to the control point. Equipments incorporate the outstanding features of Micromax design: sturdy machine-type parts; extra-heavy gears, shafts and bearings; fine construction throughout.



Further information will be sent on request; either a general catalog or specific engineering data, as you prefer.



Jrl Ad N-33-620 (9)

132—MACHINERY, August, 1944

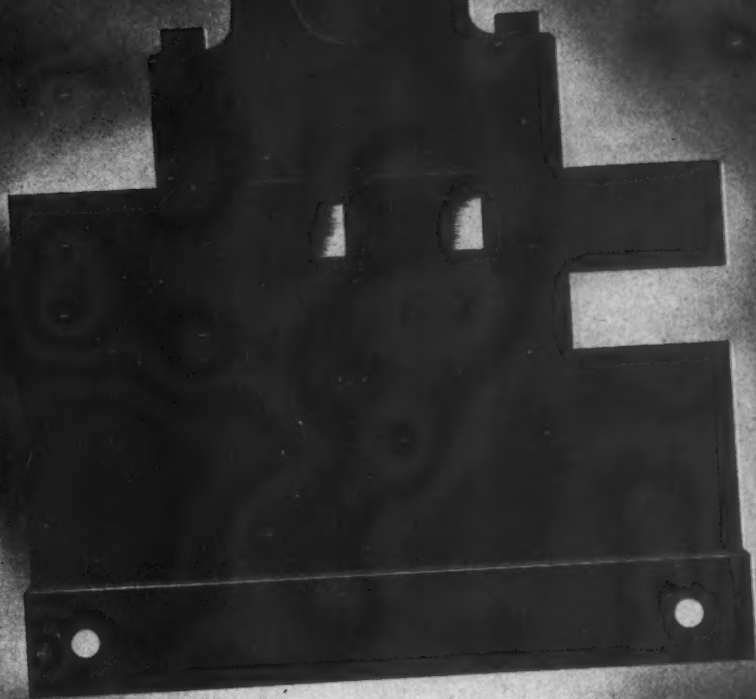


LEEDS & NORTHRUP COMPANY, 4921 STENTON AVE., PHILA., PA.

**LEEDS & NORTHRUP**

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

Molybdenum in cast steel is an answer to exacting impact requirements—hardenability is improved and temper brittleness practically eliminated.

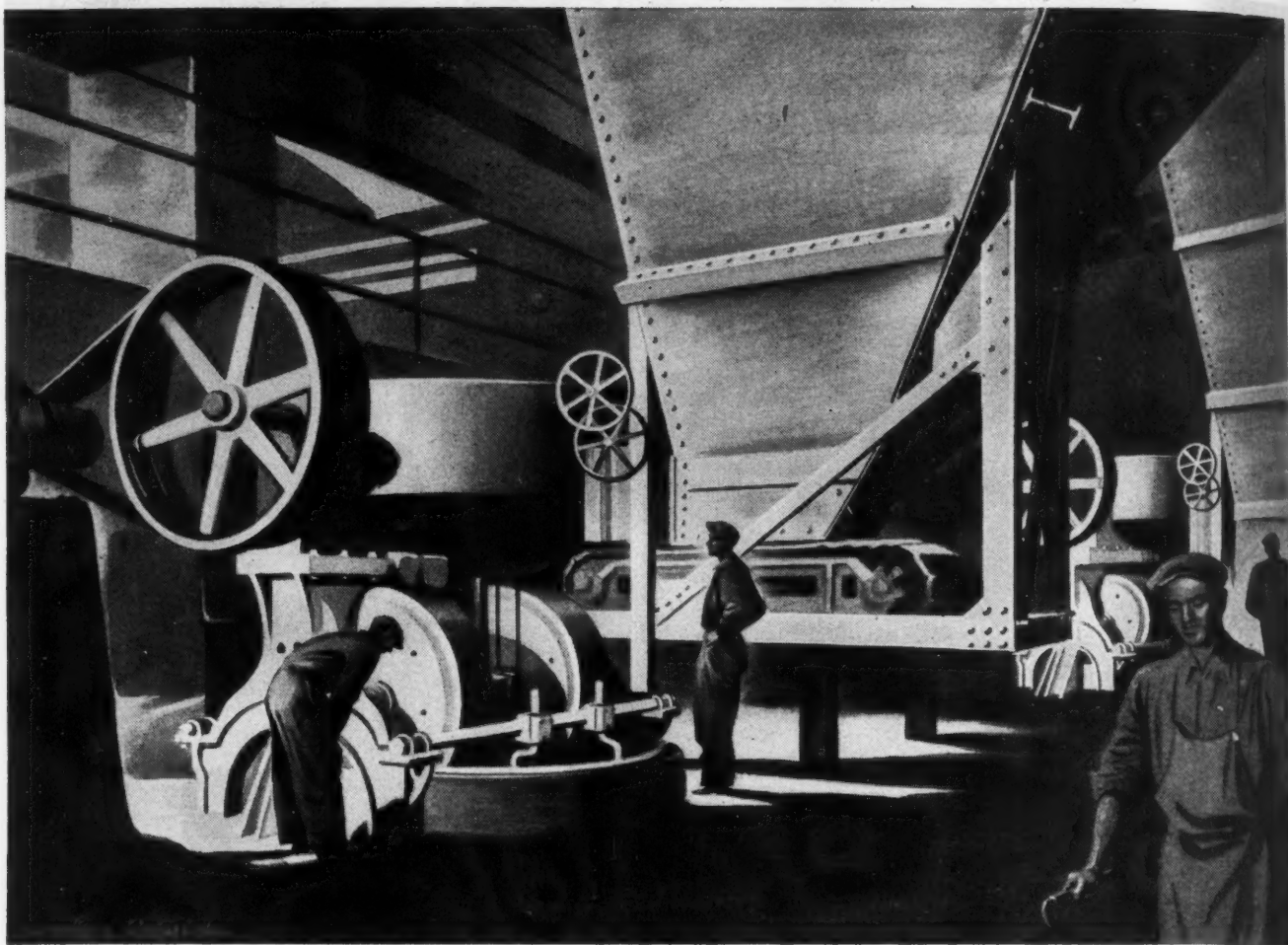


CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

**Climax Molybdenum Company**  
500 Fifth Avenue • New York City



*In ceramic production Stainless Steels, Nickel, Monel, and Nickel Alloyed Castings are used in many special applications.*

## **NICKEL AIDS THE CERAMIC INDUSTRY** *to KEEP 'EM PRODUCING!*

Many Ceramic engineers and plant operators have found it necessary skillfully to integrate the best in methods and machines to achieve wartime production.

They made the refractories branch of the industry a War Giant that's striding forward with massive output for keeping metal going on its way to war. In critical war production areas building brick for plant expansions and cement for roads on which millions travel to their wartime tasks have been available in ample quantity and on time.

No essential industry has lacked supplies of ceramics.

An important aspect in this achievement is the utilization of Nickel Cast Irons, Stainless Steels, Monel and other alloys containing Nickel...to combat the ravages of heat, corrosion and abrasion.

To minimize attendant interruptions of production, ceramic engineers...re-

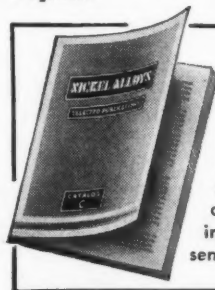
lying on their long peacetime experience with metals and alloys...made the judicious choice of Nickel alloys.

Their experience had shown them that a little Nickel goes a long way to keep equipment producing.

Nickel imparts hardness, toughness, strength and wear resistance. It fortifies crusher rolls, scrapers and other critical parts of production equipment. Nickel is specified widely in processing mechanisms...such as muller tires, scraper blades, pug mill knives, chute liners and all manner of parts subject to severe abrasive action. Nickel alloyed parts provide long service life...reducing the need for frequent replacement. Thus it is practical for plant operators to increase output and general efficiency...and all this at a very reasonable cost.

For many years it has been our privi-

lege to cooperate with foundrymen and engineers who desired help in the selection, fabrication and heat treatment of alloys. If you'd like to have such assistance...whatever your industry may be...counsel and data are available on request.



### **Catalog "C"**

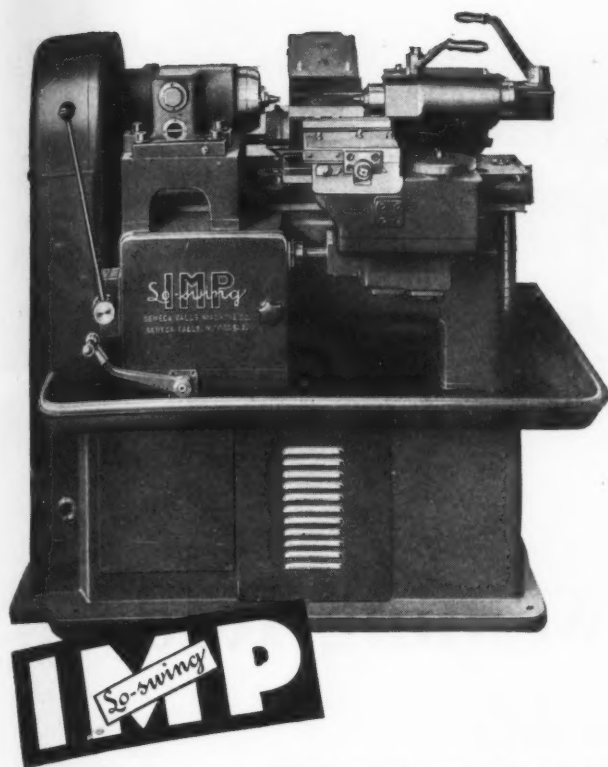
makes it easy for you to get booklets and bulletins on industrial applications of Nickel, metallurgical data and working instructions. Why not send for your copy today?

**\* Nickel \***

**THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.**

242—MACHINERY, August, 1944



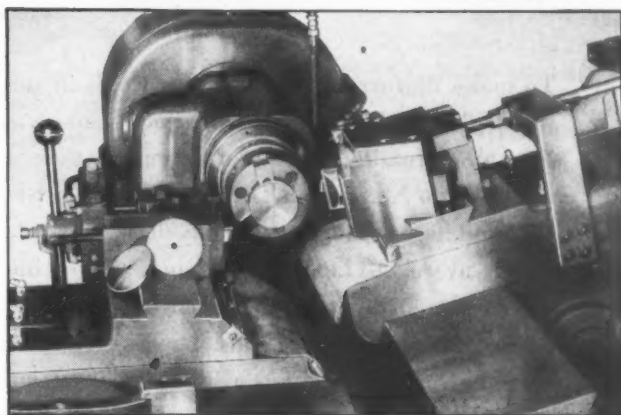


# A Versatile AUTOMATIC LATHE

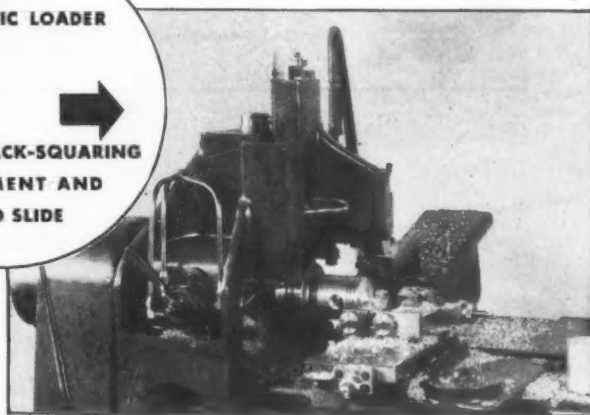
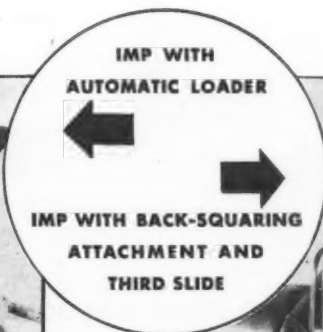
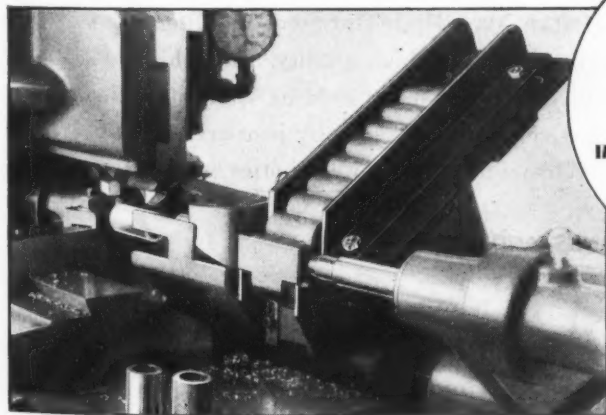
**FOR SMALL  
WORK DEMANDING  
HIGH SPEEDS  
AND EXTREME  
ACCURACY**

The Lo-swing IMP Lathe lends itself to practically unlimited tooling possibilities. Illustration above shows a standard machine. The close-up views show three typical applications of standard and special attachments to the base machine which have resulted in increased production and lowered costs. If you have a turning job requiring high speeds, fine finishes and extreme accuracy, write for IMP Bulletin N-42.

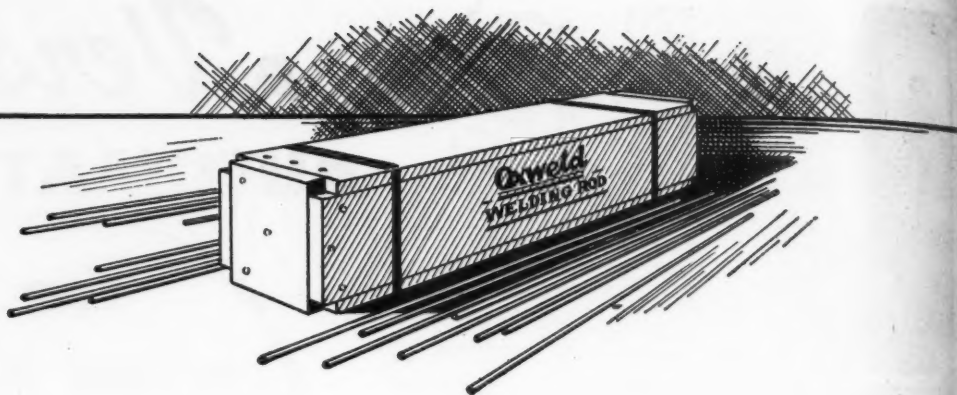
**SENECA FALLS MACHINE CO.**  
**Seneca Falls, N. Y.**



IMP WITH BACK-SQUARING ATTACHMENT



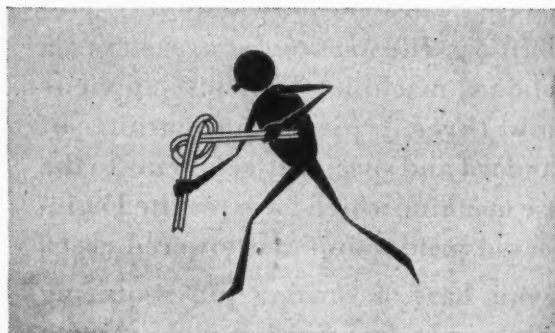
## LATHE NEWS *from* SENECA FALLS



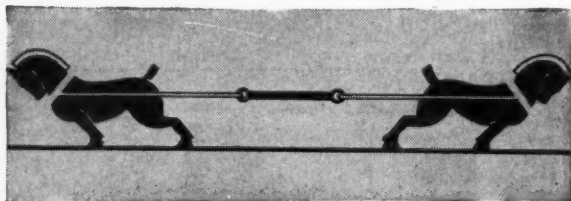
## ***Oxweld*** No. 1

# High-Test Steel Welding Rod *for strong, ductile welds*

To make uniformly high-strength welds in steel pipe, plates, sheets, structural shapes and castings, an increasing number of operators prefer to use OXWELD No. 1 High-Test Steel Welding Rod. This rod helps them to make oxy-acetylene welds which average 11,000 pounds per square inch higher in tensile strength than they can obtain with ordinary mild-steel rods. The finished weld, when correctly made, has a high degree of ductility, an important property in the fabrication of steel products and structures. Welds made with



*Higher Degree of Ductility*



*Higher in Tensile Strength*

this rod are as dependable as the base metal when subjected to such tests as longitudinal crushing, shearing, and 90-degree backward bends.

OXWELD No. 1 High-Test Steel Welding Rod is always of the same high quality. Since this rod is self-fluxing, it speeds up welding operations, lowers gas consumption, and, by properly cleaning the weld metal, helps to get better penetration.


**BUY UNITED STATES WAR BONDS AND STAMPS**



MARITIME "M" AWARD  
FOR OUTSTANDING  
PRODUCTION ACHIEVEMENT


## THE LINDE AIR PRODUCTS COMPANY

*Unit of Union Carbide and Carbon Corporation*

30 E. 42nd St., New York 17, N. Y.  Offices in Other Principal Cities

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The word "Oxweld" is a registered trade-mark of Union Carbide and Carbon Corporation.



Left: the third and final machining station, showing the arrangement of tools and the hydraulic chucks.

Here's a view of the NEW machine, a product of thirty years' experience in Mult-Au-Matic construction. The Bullard 34" Mult-Au-Matic in action saves precious time in the production of aircraft engine parts and similar war needs. The Machine features extra large capacity work up to 34" diameter x 23" height . . . massive construction . . . many labor saving features . . . six heads, two at each working station, each with independent feed . . . specially designed indexing and locking mechanisms . . . hydraulic "kickout" for each feed prevents breakage of cutting tools when the Machine is stopped on incomplete cuts . . . spindles mounted on preloaded Timken bearings . . . choice of range of spindle speeds 2.8 to 25.2 R.P.M., or 17 to 153 R.P.M. 33 to 299 R.P.M. when specified on order. Find out about the many other modern high production advantages.

Illustrated is a typical application of the Bullard 34" Mult-Au-Matic in operation at one of the Wright Aeronautical plants. Check your war production problems—with an eye to peace-conversion—with Bullard Engineers.

THE BULLARD COMPANY  
**BULLARD**  
BRIDGEPORT 2, CONNECTICUT

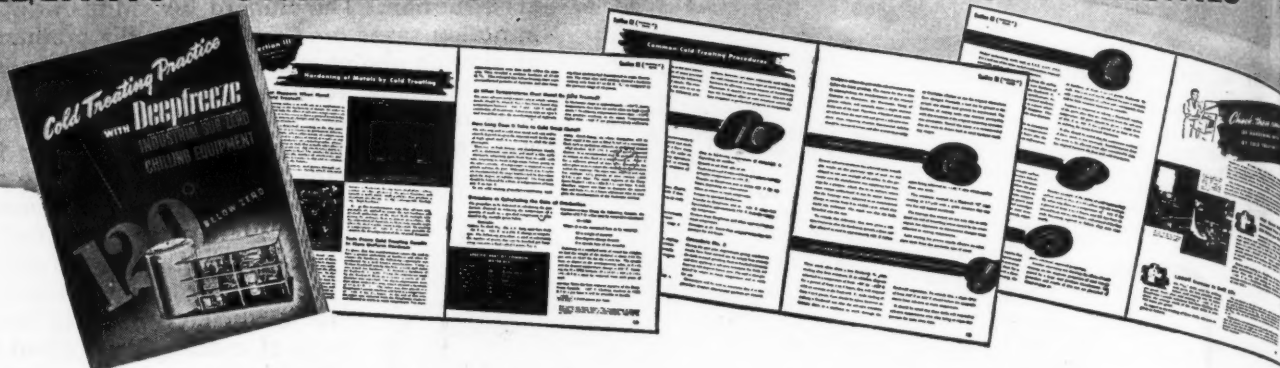
AT THE WRIGHT AERONAUTICAL PLANT  
the Bullard 34" Mult-Au-Matic used for  
rough and semi-finish machining of outside sur-  
faces of steel Aircraft En-  
gine crankcase sections. A  
similar Bullard Machine  
completes the outside diam-  
eter and semi-finish ma-  
chines all inside surfaces.



# NEWS for Production Men Heat Treating Men Metallurgists

## THIS NEW *Free* 40-PAGE BOOK SHOWS HOW INDUSTRIAL USERS ARE PROFITABLY APPLYING *Deepfreeze*

*Sub-zero Temperatures* FOR...  
HARDENING • STABILIZING • SHRINKING • TESTING OF METALS



### Actual Experiences Point the Way to Effective Use of Cold Treatment

### *in Your shop*

Sub-zero treatment of metals is being employed in more industrial applications every day. Men who aren't already using this effective process have read about the excellent results it is producing in many fields. Everyone wants last-minute information and discoveries about cold treatment—its effect on metals, fields where it is practical, procedures for treating different metals, etc.

To bring you the latest authentic cold treating practices and data, Deepfreeze has just completed a 40-page booklet that is filled with valuable information for every man working with metals.

This new FREE book explains what actually occurs when metal is subjected to chilling, and how the changes that take place are adaptable to a wide range of industrial applications.

You'll find the complete story on hardening, stabilization, shrinking and testing of metals and other materials. Three distinct methods of cold treating procedure are described in detail for use in different types of applications. Metallurgists, production men and other Deepfreeze users have contributed the results of their experiences—results that show how you can obtain the advantages of cold treating in your plant.

Cold treating is on the move. Progress has been made so rapidly that yesterday's literature no longer tells the complete story. To bring your organization up-to-date on this vitally important subject, order free copies of "Cold Treating Practice" for your key men. The coupon below is for your convenience.

### Here's a sample of how this book can help you...

These typical pages from "Cold Treating Practice" give some idea of how this valuable book can help you in your work every day. Applications similar to your own are described in detail. Even if you are now cold treating, the many new discoveries will show you if you are using this process to full advantage. Among the many timely subjects included are the following:

	See Page
Hardening cutting tools to a degree not obtainable with heat treating alone.....	12-19
Repairing broken cutters .....	20
Stabilization of metal parts to halt growth with age .....	23-26
Shrink-fit assembly that is faster and eliminates dangers of heat and press fit .....	27-32
Testing aircraft instruments and metal parts under sub-zero temperatures .....	33
Most practical chilling equipment for different types of applications .....	8-11
Cold treating procedures for different types of applications.....	14-16
Procedure for calculating the rate of production.....	13
Technical data and tables for cold treatment) .....	35-37

Deepfreeze  
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Please send.....copies of the new 1944 Deepfreeze "Cold Treating Practice" book to:

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*Send coupon today for  
your free copies*

Every executive and production man concerned with the "conditioning" of metals should have a copy of this new book. Send the coupon today for the number of copies you need for your key men.

# Deepfreeze

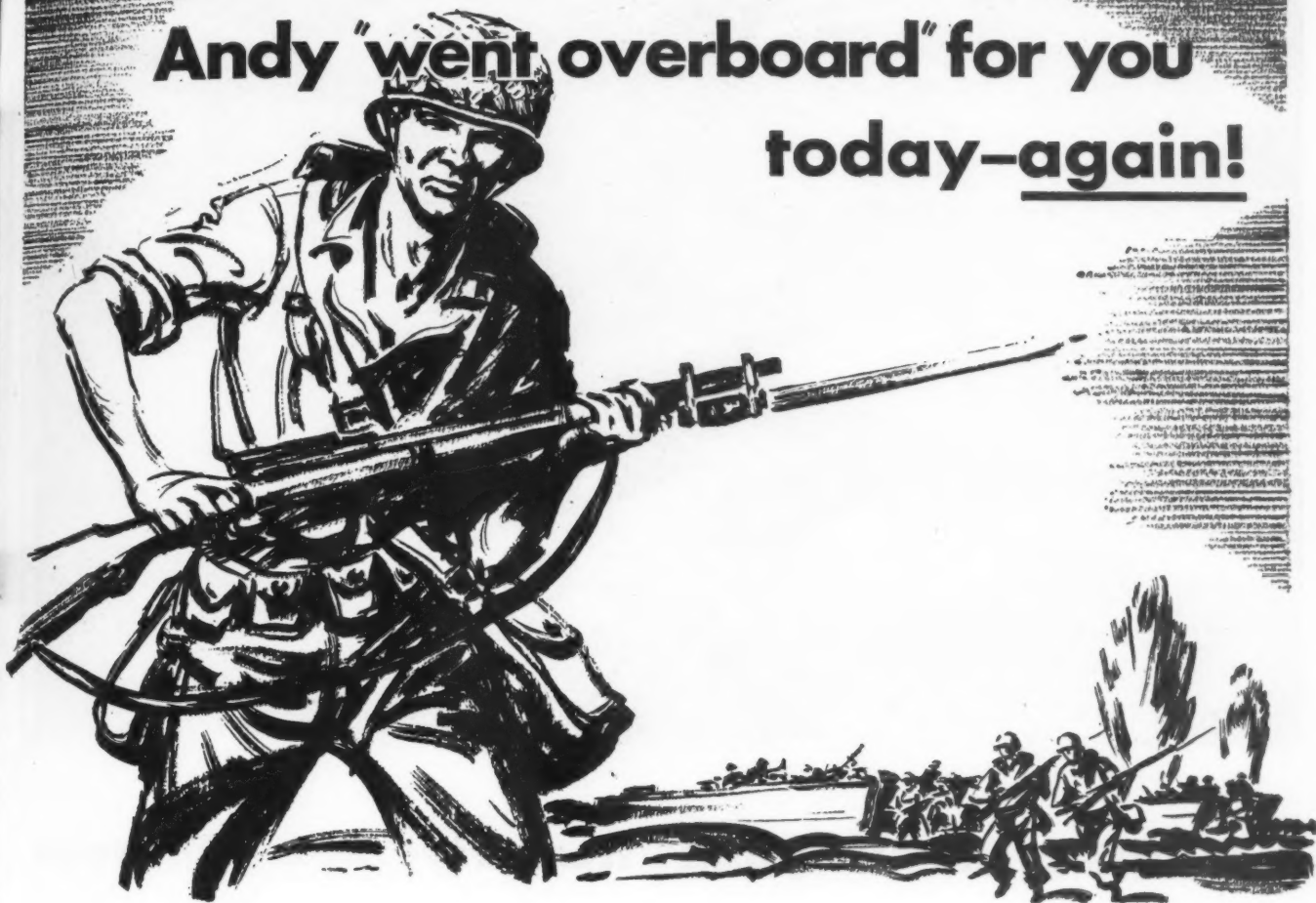
TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE  
Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Only Motor Products Corporation can make a "Deepfreeze"

2313 DAVIS STREET  
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

# Andy "went overboard" for you today—again!



**S**OMEWHERE out there early this morning Andy and his gang went overboard in a surprise attack that will make history. That recalls other days when as salesman for your Industrial Supply Distributor ♦ Andy used to "go overboard" regularly to help locate the hard-to-get materials you had to have to keep turning out war stuff on schedule.

Overseas training is helping to qualify Andy for a better job with your Industrial Supply Distributor, come peace. Meanwhile please

remember that because his organization has devoted years to preparation for the peak demands of Industry, your Distributor has earned the opportunity to help you keep your present war production up to schedule.

Your Distributor can furnish everything you need in equipment, materials, supplies. Make him your central source instead of ordering from the factory and you will save manpower and time, reduce paper work and expedite your deliveries.

Till Andy comes home—and from then on—

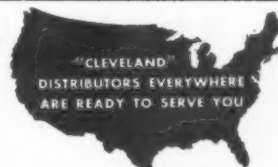
Telephone your **ISD** **FIRST!**



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## For Hitting the "Pinpoint" from Five Miles Upstairs

### *Microhoning Provides Vital*

High altitude bomb sights need a certain number of bearing surfaces of almost perfect precision accuracy and surface finish. The amazing accuracy of our bomb sights depends on this near-perfect accomplishment.

The thousands of these bomb sights needed made it necessary to achieve this fine instrument precision at production speed.



**MICROMATIC**  
**HONE CORPORATION**

DETROIT 4, MICHIGAN

Ordinary machining practice can't produce such results—and fine instrument methods just aren't fast enough.

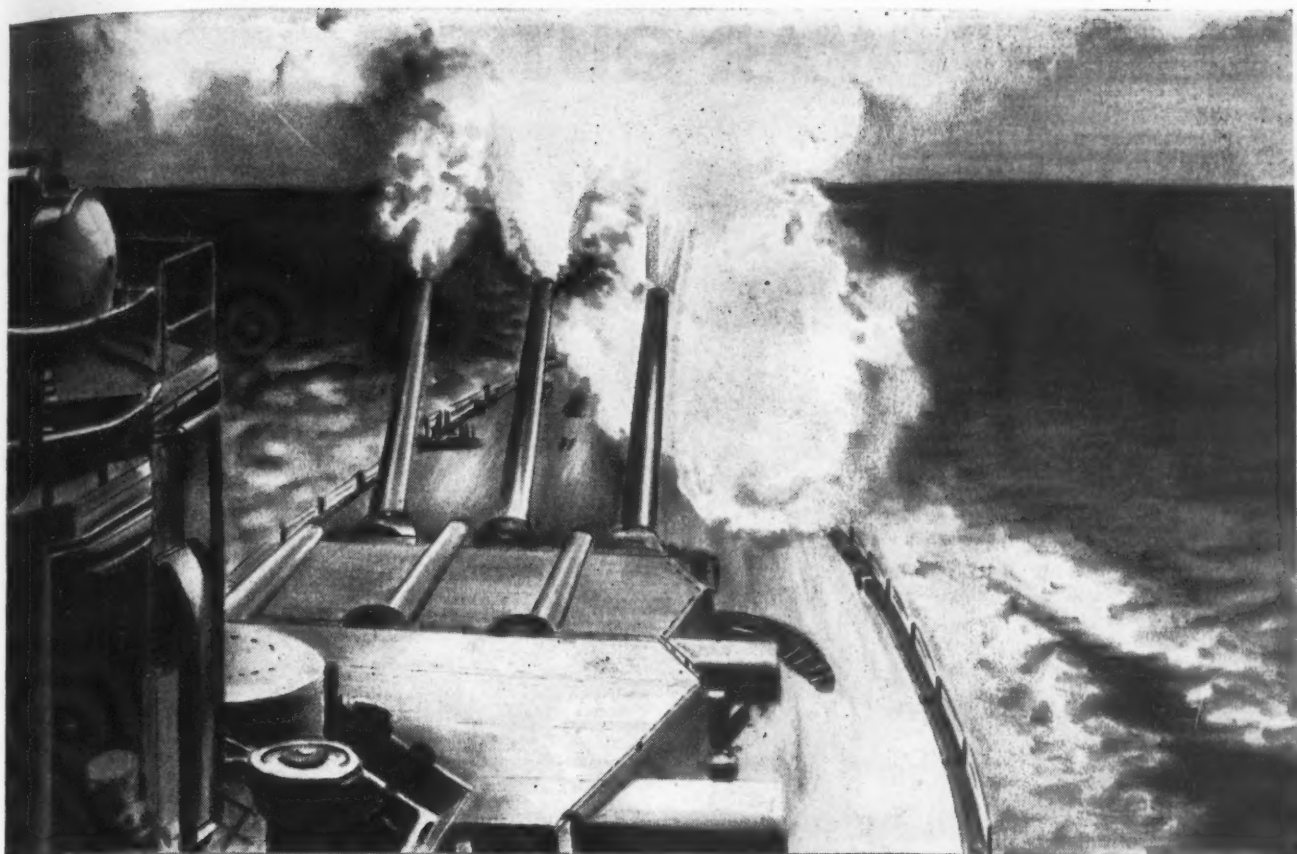
Microhoning bridged the gap. By means of this highly controlled abrading process, the extreme precision needed was obtained at production rates.

This modern final machining process will generate dimensional accuracy to "tenths" and fractions of "tenths", and provide any desired surface finish. It is applicable to the bores of these bomb sight bearings as it is to highly loaded gun turret bearings.

Precision Microfinish Honing will make many important contributions in postwar processing and Micromatic engineers will be ready with many new honing developments.

MAKERS OF HONING MACHINE TOOLS  
248—MACHINERY, August, 1944





## ... or Blasting a "Tin Can" Beyond The Horizon

### *Precision Bearings in Wartime Production*

A battleship gun turret is a complex precision instrument on a gigantic scale. Each complete turret weighs about 1550 tons—as much as an entire medium weight destroyer. This great mass must not only move smoothly, but also very rapidly—guns must be quickly targeted with extreme precision and without backlash. That calls for something extraordinary in the way of bearings.

They must be dependable and have amazing accuracy. Inaccuracy or the slightest imperfection of operating fit would destroy the telescope precision needed to make each shot count.

The best ordinary machining methods won't provide the precision nor the fine surface finish necessary for accurate frictionless operation.

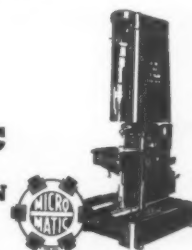
Microhoning was found to be the answer. Micro-

honing is a process of final machining which generates average bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour. In production of turret bearings—not only for battleships, but also for cruisers and destroyers—Microhoning has provided the desired combined precision and finish.

And, it will be more constructively useful in coming times of peace than it has been in war production.

**MICROMATIC**  
**HONE CORPORATION**

DETROIT 4, MICHIGAN



MAKERS OF HONING MACHINE TOOLS

MACHINERY, August, 1944—249

# TO SPEED WAR OUTPUT "DOUBLE UP" WITH R and L!



With R&L Turning Tools on your turret lathes and screw machines you can speed war production by "doubling up" on many operations. This single, simple tool will do drilling . . . rough or finish turning . . . turning two diameters . . . chamfering . . . centering . . . burnishing. And its combination features allow you to do two or three of these operations at one time. In addition it can be changed in ten seconds from right to left hand operation. R&L Turning Tools are simply, ruggedly built in five different sizes for performing a wide range of jobs. If you are looking for extra production capacity—and need it quickly!—write for the R&L Booklet showing the many time-saving operations that can be performed with this one simple tool.



*Also Manufacturers of the*  
**R and L TAP AND DIE HOLDER**  
**R and L UNIVERSAL TOOL POST**  
**R and L ROLLER BACKREST**  
**for the R and L Turning Tool**

# **R AND L TOOLS**

**1825 BRISTOL STREET, NICETOWN, PHILADELPHIA, PA.**



**THAT'S RIGHT!...**  
**NO FAN IS NEEDED ON THIS**  
**NEW POPE Sealed Package**  
**SURFACE GRINDER SPINDLE**  
And That's One Reason For Putting  
It On Your Machines Right Away

#### HERE'S THE STORY IN A NUTSHELL:

1. The POPE Sealed Package Spindle has a *G-E motor sealed in*. It runs at peak efficiency, without attention, for the entire life of the bearings. There is no fan, no air passages or openings of any kind. Dust, dirt, nuts, bolts and fingers are sealed out.
2. *SKF Super-Precision, Double-Row Roller Bearings* are sealed in, too. No oiling or greasing to bother with or forget.
3. *It produces finer finishes*; as a result of its better design and construction.

4. *It does better work faster*. This Spindle has the power, the bearing capacity and the rigidity to rough off surplus metal rapidly when required.
5. *It operates horizontally, vertically or at any angle*. This Spindle is ideal for boring mills, planers, milling machines and other machine tools for special work as well as for 6" x 18" surface grinders for which it is primarily designed.

#### See For Yourself What It Will Do On Your Machines And Your Work

The performance and operating advantages of this POPE *Sealed-in Motor, Sealed Lubrication Spindle* justify immediate consideration for replacement of existing spindles. For all the facts and figures, get in touch with



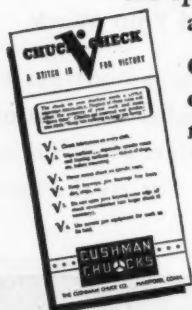


# *Stop and think...*

## **WHEN YOU USE THAT wrench!**

● A wrench is a good symbol for industry today. We've got our enemies where we can really begin to apply the squeeze. But when a machine tool operator puts the wrench to his chucks he should not only think of the direct contribution he is making to Victory but should also bear in mind that the chucking equipment he is operating must be carefully conserved and maintained as a vital part of our war production facilities.

We build a high degree of precision into Cushman Chucks and they are capable of rendering long, trouble-free service. But, like any other fine tools, they require careful handling and intelligent maintenance. They should be selected, in the first place, for the specific job they are to perform. They should be regularly lubricated, kept clean and not subjected to overload or abuse.



Cushman Chuck Check Cards . . . available free to you for distribution to your operators . . . will help you conserve these important tools, prevent delays and reduce spoilage. Write to The Cushman Chuck Co., Hartford 1, Conn., U.S.A.

**A WORLD STANDARD FOR PRECISION**



# **CUSHMAN CHUCKS**

# H E N D E Y

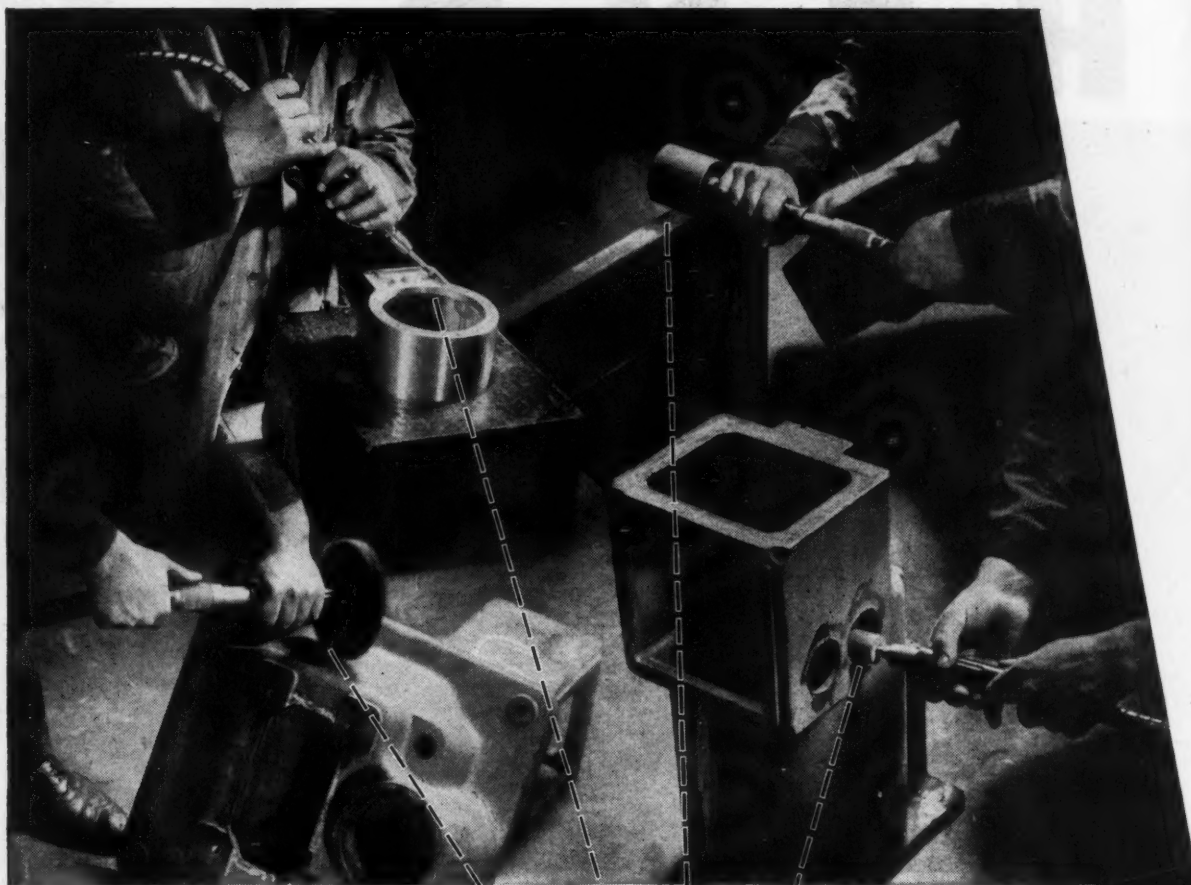


*... for*  
**PRECISION PRODUCTION**  
*of* **AIRCRAFT**

In the busy toolrooms and production departments of leading aircraft plants HENDEY Lathes and Shapers are helping speed output and maintain the extremely high precision standards required. HENDEY Machines have what it takes (through correct design and solid construction) . . . sustained accuracy, and ease of operation that makes the best use of available manpower . . . and the proved dependability that comes from seventy years of experience at making precision production tools. Investigate HENDEY Lathes and Shapers today!

**THE HENDEY MACHINE CO., Torrington, Connecticut**

★ **Manufacturers of High Speed Heavy Duty Lathes and Shapers**



WHEN IT'S *Versatility* YOU WANT!



#### HC-5

*1/2 H. P.—Multi-speed countershaft unit, 900 to 3600 R.P.M. Mounted bench-height on 3-leg castor base, 360° swivel.*

● Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 617 So. California Ave., Chicago, Ill.



**HASKINS**  
*Flexible Shaft*  
**EQUIPMENT**

More VERSATILE Machines for  
More PROFITABLE Work



# GORTON

SPECIALISTS FOR OVER 50 YEARS IN

*Tracer -  
Controlled*  
MILLING

*Automatic  
\* Rotation  
PROFILING*

\* WORK and MASTER  
ROTATE with TABLE  
MOVEMENT



## CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" stock, merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

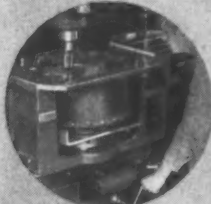
### PRODUCTION DATA

**Material**—S.A.E. 1020 Seamless Steel Tubing.  
**Operation**—Rough and Finish Milling of 10 Wells (varying from  $\frac{3}{4}$ " wide x  $\frac{3}{8}$ " long... to  $\frac{35}{8}$ " wide x 2" long), .062" deep.  
**Cylinders**— $\frac{99}{16}$ " O.D. x  $7\frac{25}{32}$ " long.  
**Feed**—Manual... Spindle Speed—4,000 r.p.m.  
**Tolerances**— $\pm .005$ ".  
**Time**—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

### ENGINEERING SERVICE... FREE

Have the advantage of 50 years of Gorton Specialized Tracer Control Experience in your shop—call nearest Gorton dealer or write to Gorton factory at Racine, Wisconsin.

The Right Size  
The Right Type  
of Machine  
for Every Job...  
From 2 oz. to 2 ton  
DIE BLOCKS



Tracer-Controlled  
MILLING



Tracer-Controlled  
DUPLICATING



Tracer-Controlled  
ENGRAVING



Tracer-Controlled  
ETCHING



**GORTON** Precision  
MACHINES



CUTTER  
GRINDERS



ETCHING  
MACHINES



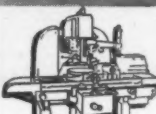
3 & 2 Dimensional  
PANTOGRAPHS



Surface & Universal Head  
Super-Speed MILLERS



Manual & Electric Control  
DUPLICATORS



### TEAR OFF COUPON AND MAIL TODAY

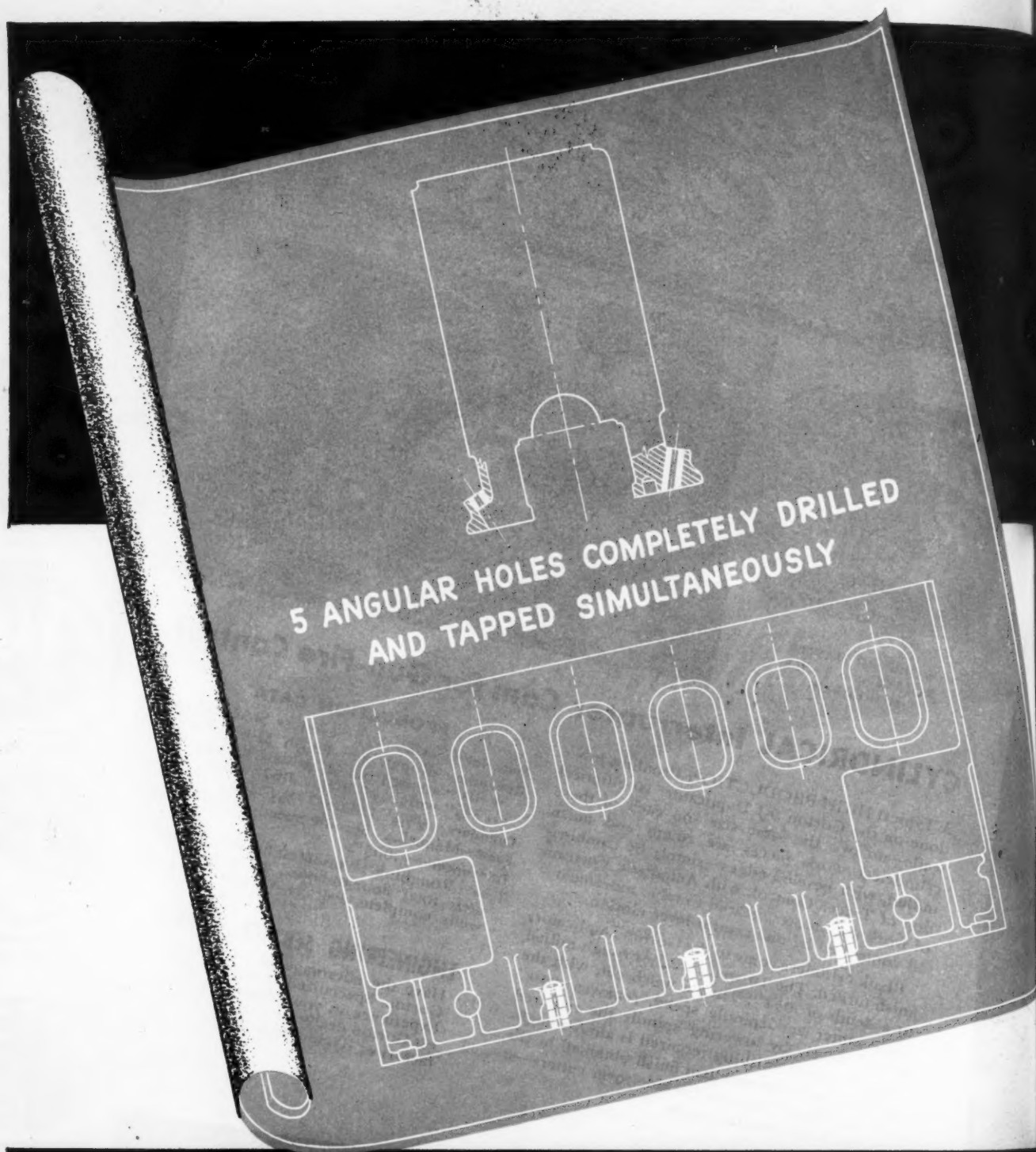
George Gorton Machine Co.,  
1308-13 Racine St., Racine, Wis.  
Send me these free books  
☐ Condensed Catalog  
☐ Die and Mold  
Duplicators



Name..... Title.....  
Company.....  
Address.....  
City..... State.....

# ***AUTOMATIC***

**LOADING  
CLAMPING  
EJECTION**

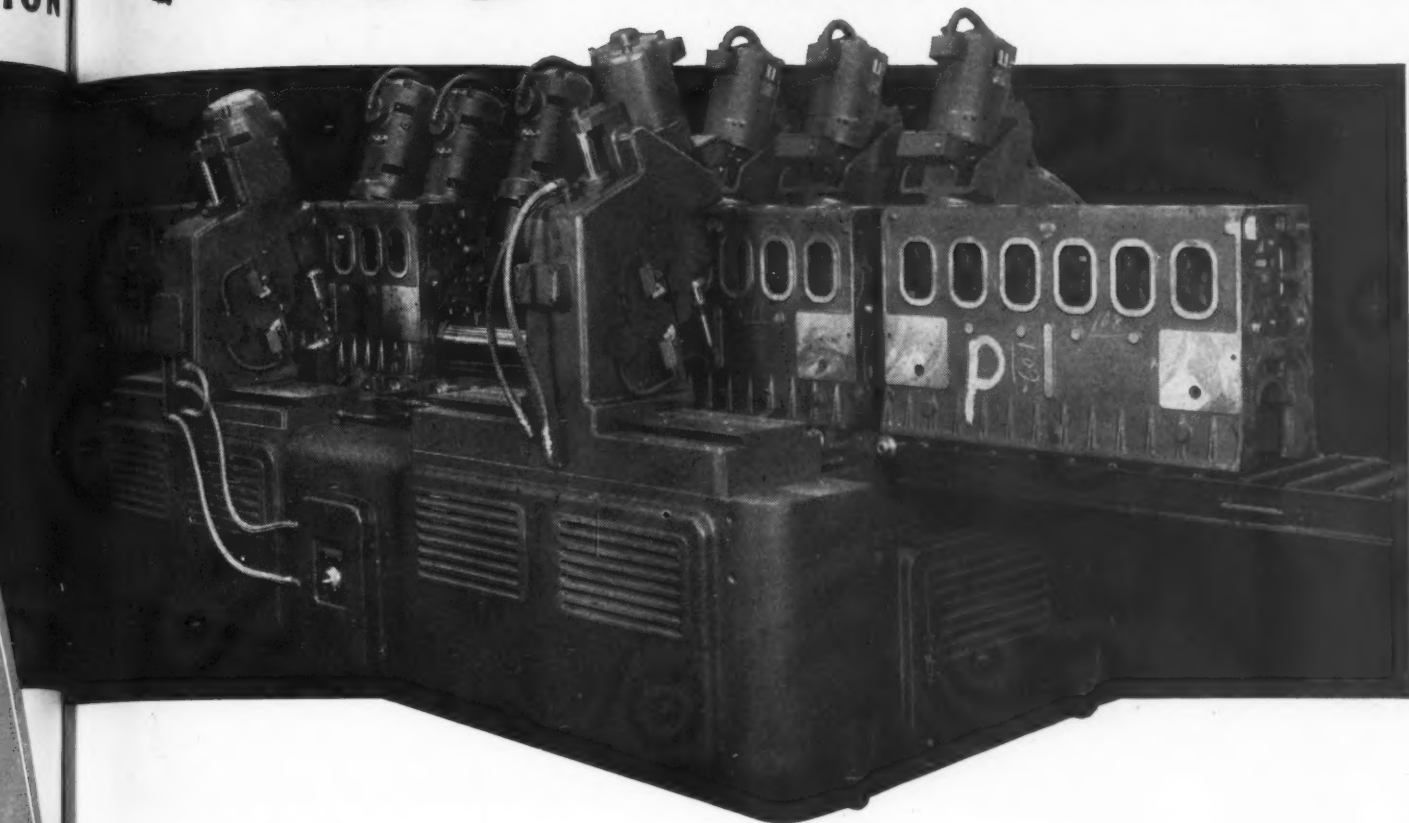


# **CROSS**

New York • Detroit • Chicago

# PLUS

## 45 PIECES PER HOUR DRILLED AND TAPPED



● **AUTOMATIC** — Yes, because the cylinder blocks are transferred from station to station, and drilled and tapped without operator attention.

CROSS ENGINEERS designed and built this *special machine* to drill and tap five angular holes in a Diesel engine cylinder block. The results typify the principle behind every Cross *Special Machine*—high-speed, automatic removal of metal on equipment anyone can operate.

In this case, 45 blocks per hour are drilled and tapped at 80% efficiency, the work being moved from station to station and machined without any attention from the operator. But more than that, the work is fed, clamped, unclamped and ejected automatically, too. All motions are mechanically and hydraulically actuated, electrically synchronized and controlled. Inexperienced or unskilled operators maintain accurate tolerances and obtain large-volume production from a machine that occupies comparatively little floor space.

● **PLUS** — because, in addition, feeding, locating, clamping and ejection of the work are accomplished automatically at the push of a button.

Thus Cross engineering produces a *special machine* to combine difficult drilling and tapping operations and perform them at high speed at the push of a button—a principle Cross can apply to your many metal-removing problems.

Cross Engineers are prepared to help lower your costs and assist with your manpower difficulties by designing, building and installing special machinery in your factory and showing your workmen how to operate it.

A new Cross Catalog contains 35 detailed case histories of successful Cross *Special Machines*. For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 53.

# Special Machines •

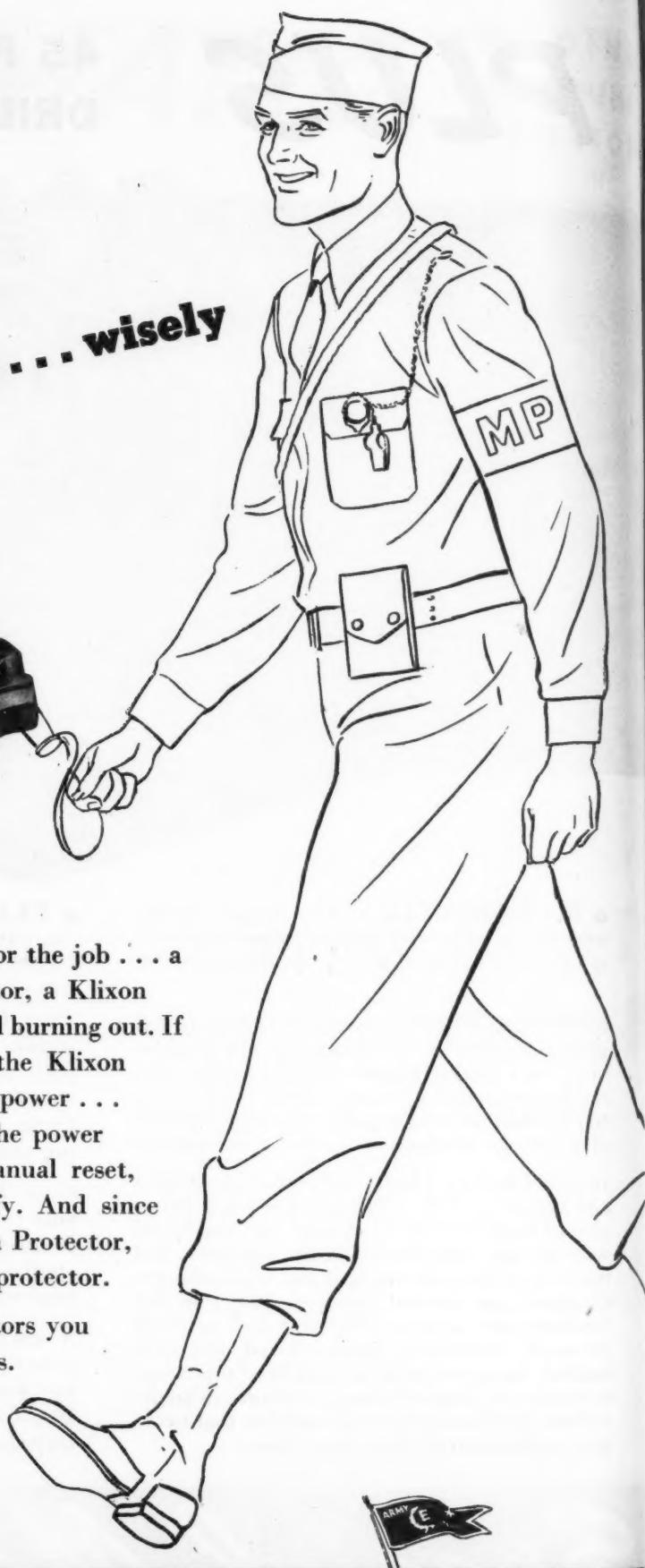
for automatically performing any one or a combination of metal cutting operations  
TURNING • MILLING • DRILLING • BORING • REAMING • TAPPING • GRINDING

S-11



**This MP\* rules motors . . . wisely**

**\* MOTOR PROTECTOR**



For policing motors here's the MP for the job . . . a Klixon Motor Protector. Built into the motor, a Klixon Protector keeps motors from overheating and burning out. If the motor gets dangerously hot, it steps the Klixon Protector and automatically clicks "off" the power . . . waits for the motor to cool . . . then clicks the power "on" again—either automatically or by manual reset, depending on the type of reset you specify. And since the motor manufacturer installs the Klixon Protector, you get a tested combination of motor and protector.

Get accurate overheat protection in the motors you buy by specifying Klixon built-in Protectors. They're available for D. C. motors up to 30 volts . . . for A. C. motors all sizes.

**KLIXON**

**MOTOR PROTECTORS**

SPENCER THERMOSTAT CO., ATTLEBORO, MASSACHUSETTS



All Improved Movements carry the suffix "2" on the top plate.  
Full-Jeweled Movements are now available.

## The IMPROVED FEDERAL DIAL INDICATORS

Again Federal steps ahead with new improvements and refinements in the design and construction of its Dial Indicators. Effective at once all models, except the "A" size, will include the following improvements:

**Better Proportioned Gears**— Revised gears enable more positive mounting with less danger of loosening. Greater strength in the rack gear is obtained because of its new and larger size.

**Improved Pinion Bearing**— The bracket supporting this bearing has been enlarged. The bearing itself is jeweled. The method of positioning it is improved. This means more precise tooth contact and more rigid support.

**More Accurate Alignment**— of the gear bearings in the top and bottom plate is insured by improved manufacturing methods.

**Greater Strength**— The rack slide is held more positively.

**Elimination of Distortion**— By improved means of attaching the top and bottom plates together, better alignment is obtained and bearing friction reduced still further.

**More Positive Movement Setting**— Accuracy of the movement is improved. There is also greater latitude in adjusting the movement with the rack spindle.

### FEDERAL

Was the First to . . .

Use Jeweled Bearings.

Introduce Low-Friction Indicators.

Reduce Glare by Blackening the Indicator Bezels, Cases, etc.

Standardize Dimensions for Interchangeability.

FEDERAL PRODUCTS CORPORATION • 1144 Eddy St., Providence, R. I.

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

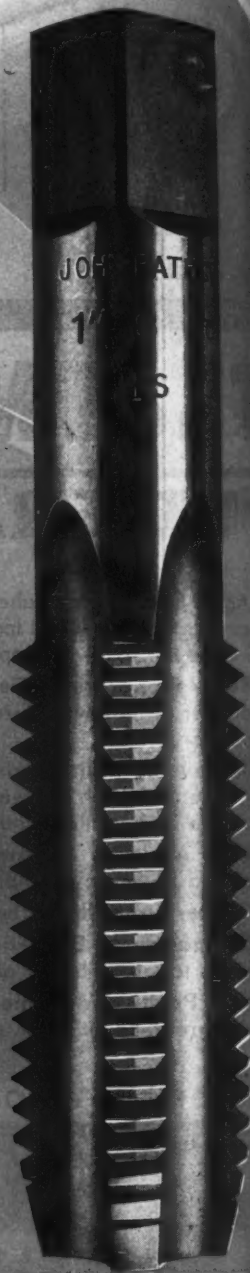


*... when Tapping*  
**MUST** *be accurate*

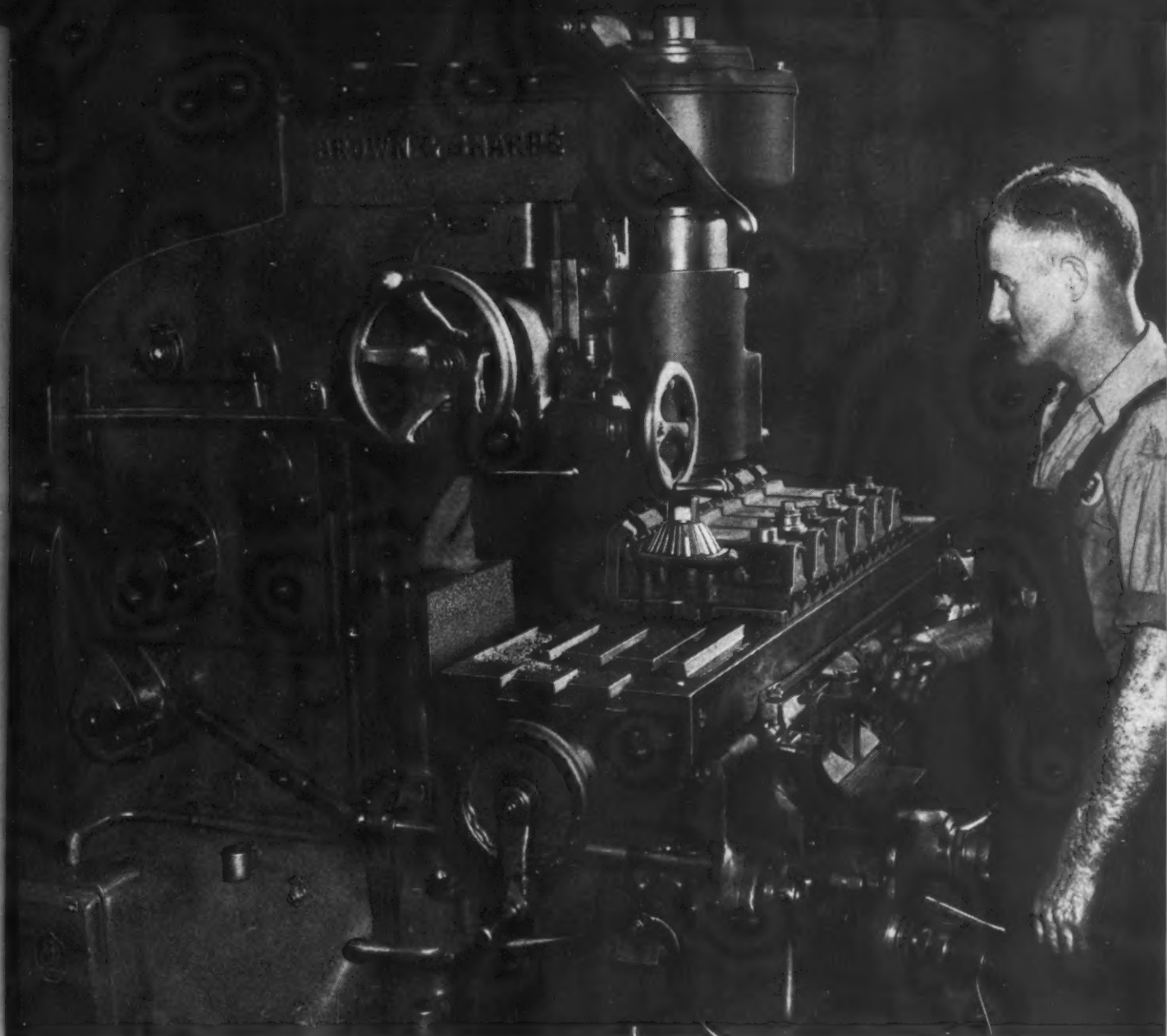
**RELY ON  
BATH TAPS!**

GROUND FROM  
THE SOLID!

JOHN BATH AND COMPANY, INC., WORCESTER, MASS.







## FOR YOUR PRODUCTION VERTICAL MILLING .. N<sup>o</sup> 2 Vertical <sup>Standard Type</sup> available for Prompt Delivery

Investigate the No. 2 Vertical Milling Machine—Standard Type for accurate toolroom set-ups and production milling...

**BS** BROWN & SHARPE MFG. CO.  
PROVIDENCE 1, R. I., U.S.A.



**Sturdy construction—Rigid set-up—Ease of handling—all help the operator to secure good production.**

Wide ranges of speeds and feeds, hand and power feed of spindle head, and ample throat distance—of marked advantage for many types of end mill and face mill operations.

# BROWN & SHARPE

# DAKE takes over

## IMPORTANT ANNOUNCEMENT!

Manufacturing and sales rights to Atlas Arbor Presses have been purchased outright by the Dake Engine Company. Atlas Presses, which have enjoyed world-wide acceptance for more than a quarter of a century, will be made by Dake to the same high standards of workmanship and performance as in the past. However, to avoid confusion, these presses will now be known as Dake Arbor Presses.

Dake Presses are available in the full range of Atlas models in capacities from one to seventy tons... all incorporating the original Atlas Square Ram that features larger bearing surfaces, reduces friction, and prolongs the life of the press.

All inquiries and orders for equipment listed in old Atlas Arbor Press catalogs, directories, or advertisements should now be addressed to The Dake Engine Company of Grand Haven, Michigan.

Send all inquiries to DAKE

**DAKE THE DAKE ENGINE COMPANY**

# Atlas Arbor Presses

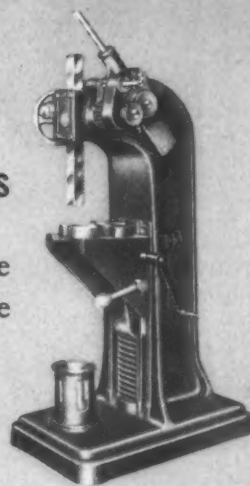


## SIMPLE LEVER PRESSES—8 MODELS—1 TO 5 TONS

Five models of quick acting presses from 1 to 2 tons. Three larger models up to 5 tons, operated by ratchet device for adjusting lever to most convenient position.

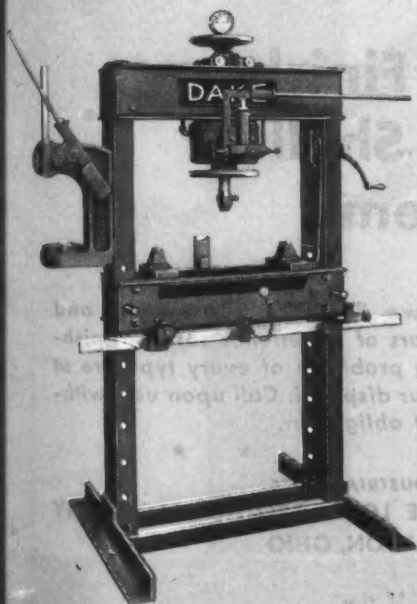
## COMPOUND LEVER PRESSES—6 TO 25 TONS

Seven models adjustable quickly to simple or compound leverage with a sliding pin. Handwheel advances ram to work—spindle brake sets ram in any position. Available in bench and floor types.



## HYDRAULIC PRESSES 50 to 70 TONS

This 50-ton hydraulic press is equipped with extras not furnished as standard. These presses are rugged, powerful, easy to handle. Two sizes handle work up to 33 and 44 in. diameters.



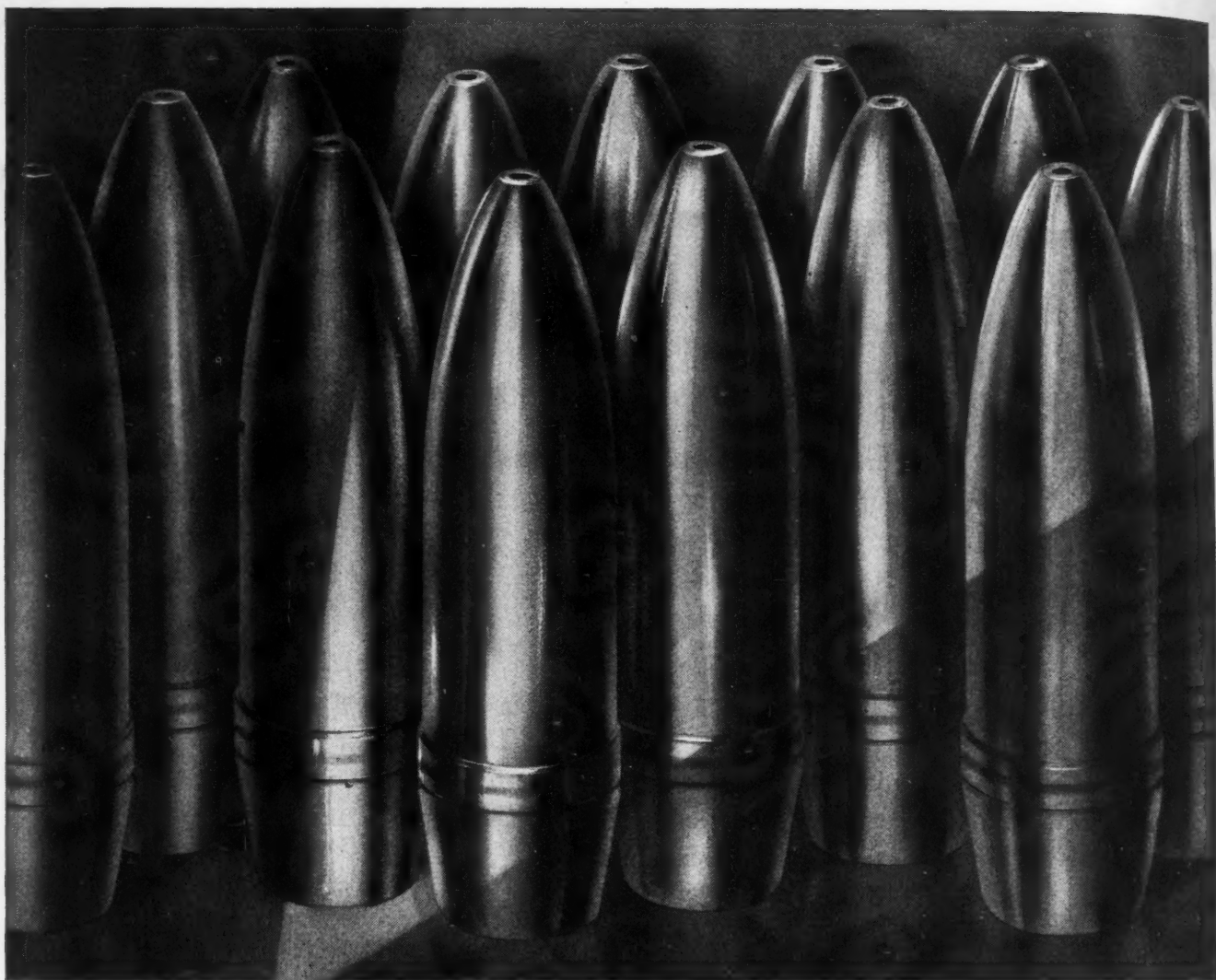
## MISCELLANEOUS PRESSES

- Wheel Operated Production Presses
- Double Column Presses
- Straightening Presses
- Portable General Purpose Presses
- Hydraulic Work Heads

**IN GRAND HAVEN, MICHIGAN**

**DAKE**





## A Lowe Brothers Finish Solves a 155 MM Shell Production Problem

A manufacturer of 155 mm Shell Casings had a problem on his hands. Poor adhesion of a specification finish was resulting in a high percentage of rejects, slowed-up production, and mounting costs.

A switch to a Lowe Brothers finish, made on the same specification, solved the problem.

According to the manufacturer, this Lowe Brothers Specification finish is, today, giving perfect adhesion and faster drying without a single change in cleaning or finishing methods.

The material supplied by Lowe Brothers "sets up hard, does not mark up or scratch off easily, and speeds up production." Result—fewer rejects, lower cost, and on-schedule production.

Whatever your problem—whether it be for War or Peacetime product finishing—remember that

Lowe Brothers know-how, and years of experience solving finishing problems of every type are at your disposal. Call upon us—without obligation.

★ ★ ★

INDUSTRIAL SALES  
THE LOWE BROTHERS COMPANY  
DAYTON, OHIO

# *Lowe Brothers* **WARTIME FINISHES** *for Industry*

IN ACCORDANCE WITH U.S. GOVERNMENT SPECIFICATIONS

# GAGES

*from a fine family*



Two things you look for when selecting Gages—initial accuracy and maintained accuracy.

Gages bearing the PM Diamond Emblem qualify on both of these excellent family characteristics.

Beginning with the right steel, we machine and grind to the high standards demanded by today's precision work, and then finish to insure long life in service.

Pipe Machinery maintains a large stock of standard Plug, Ring and Thread Gages, from which prompt shipments are made to meet emergencies. Wire Department EX for this quick delivery service.

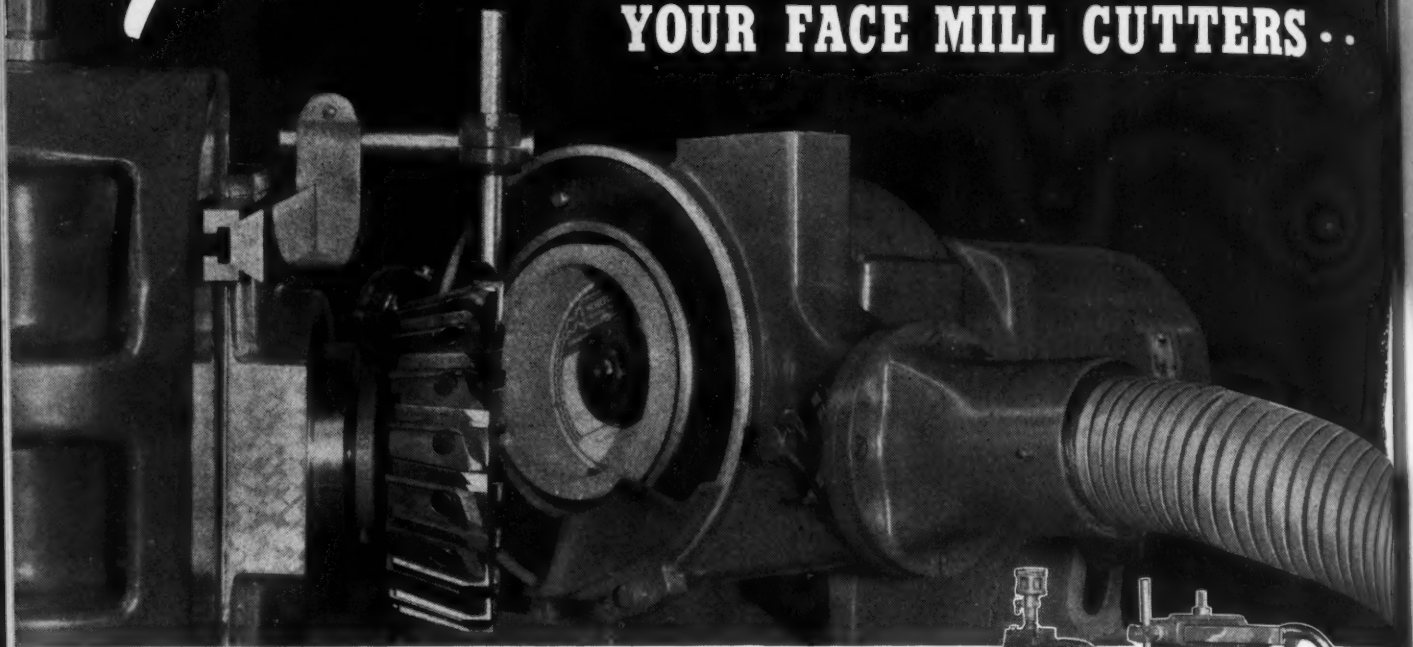
Special Gages and Cutting Tools are engineered by experts and built on special order. Send us details of what you want to accomplish.



**The PIPE MACHINERY COMPANY** Cleveland, O.

**GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS**

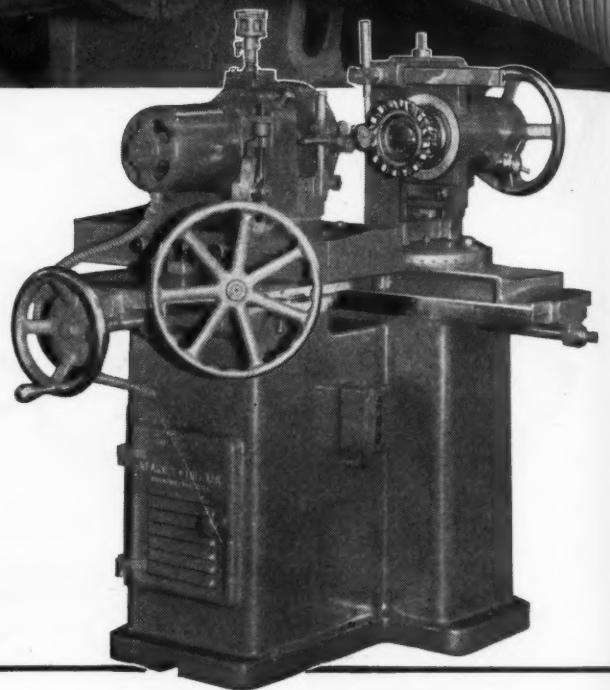
# *Increase* PRODUCTIVE TIME BETWEEN GRINDS ON YOUR FACE MILL CUTTERS..



## ...Assure a Greater Return From Your Milling Machine Investment

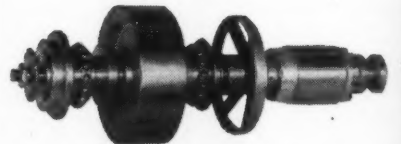
Avoid waste of valuable productive time by constant changing of face mill cutters. The Milwaukee Face Mill Grinder sharpens each tooth accurately — makes cutters last longer — require less frequent re-grinding — decreases "down-time" on your milling machines.

An indispensable machine of strength, precision and capacity, the Milwaukee Grinder grinds Tungsten Carbide and other cutters, ranging from 3 inch to 16 inch diameters, to within .0002 runout — and does it fast.



### MILWAUKEE FACE MILL GRINDER FEATURES:

- Unusual Rigidity
- Accuracy to within .0002 runout
- Finger-tip controls — handily located for simplified operation
- Design and performance of the Milwaukee substantially reduces sharpening time
- The three-bearing dynamically balanced grinding wheel spindle rotates at 3400 r.p.m.; heavy flywheel keeps abrasive wheel up to full grinding speed — maintains accurate uniform cutting action — each tooth perfectly ground.



- Set-ups quickly made with graduated dial, facilitating quick adjustments

For complete information write for Bulletin 41-A

Rotary Head  
Milling Machine

•  
Autometric  
Jig Borers

•  
Center Scope

## Kearney & Trecker

### Products

CORPORATION

Milwaukee, Wisconsin

Subsidiary of Kearney & Trecker Corporation

Milwaukee  
Face Mill Grinder

•  
Milwaukee  
Midgetmill

•  
Milwaukee  
Speedmill





## FLEXIBILITY

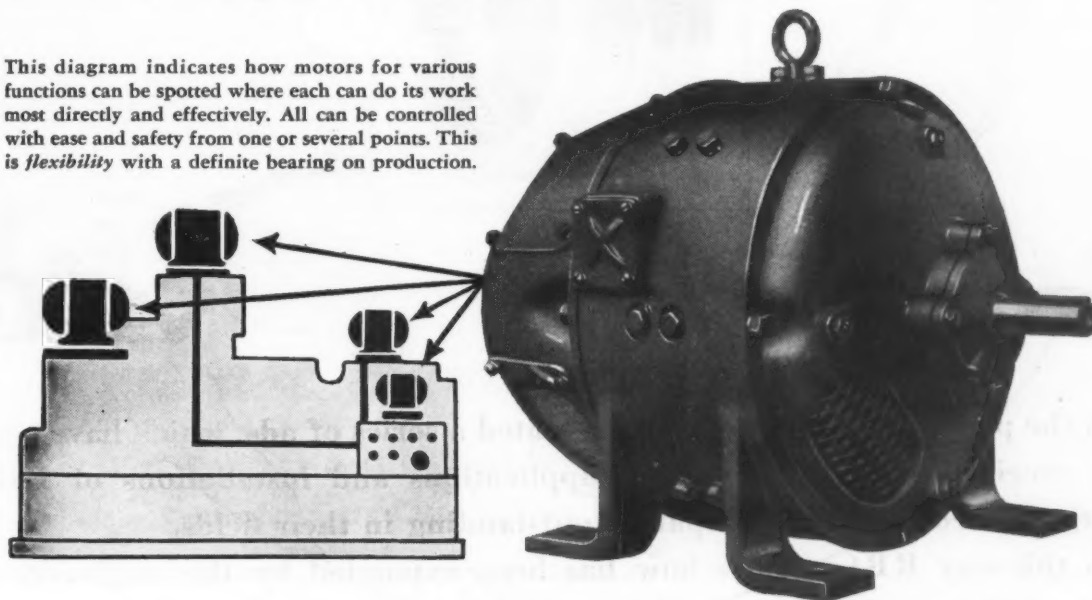


To designers and users of modern production machines Reliance Motor Drive offers flexibility combined with simplicity. Without gears, brakes, clutches or other mechanical go-betweens it performs all these functions: speed control, reversing, controlled acceleration, braking, remote control, slow

speeds for inching, threading or inspection.

Reliance application engineers are production minded. They have had wide experience in cooperating with manufacturers' engineers on specific motor-drive applications. We think you will like the way they work. Just phone or write our nearest office.

This diagram indicates how motors for various functions can be spotted where each can do its work most directly and effectively. All can be controlled with ease and safety from one or several points. This is *flexibility* with a definite bearing on production.



# RELIANCE<sup>AC</sup><sub>DC</sub> MOTORS

RELIANCE ELECTRIC & ENGINEERING CO.

1088 Ivanhoe Road • Cleveland, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S.C.) • Houston • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • Salt Lake City • San Francisco • Syracuse • Washington, D. C. • other principal cities.

AROUND THE WORLD

**RBC**

**BEARINGS -**  
*Important in the Past,  
More Important in the Future.*



In the past 15 months we have presented a series of ads, which have been well received, describing various applications and installations of RBC Bearings used by many companies outstanding in their fields.

In this way RBC's know-how has been expanded by the engineering, design and manufacture of roller and needle bearings for vital equipment.

This experience enables us to present a series of ads, starting next month, showing new ideas in correct bearing procedure.

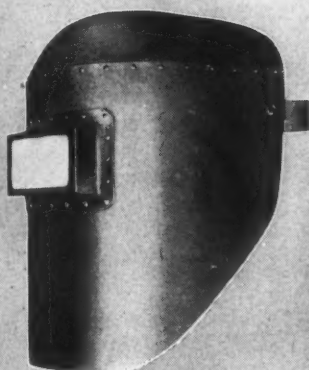
**END THE WAR QUICKLY—BUY MORE BONDS**

**ROLLER BEARING CO. of AMERICA**  
**TRENTON . . . . NEW JERSEY**

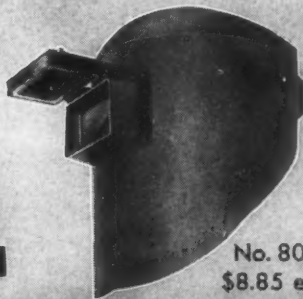


# POPULAR WELDING HELMETS

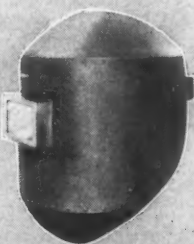
*Five Styles - All Sizes*



No. 45-A  
\$6.60 each\*



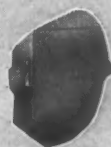
No. 80-A  
\$8.85 each\*



No. 25-A  
\$7.05 each\*



No. 70  
\$3.40 each\*



No. 66  
\$4.75 each\*

These quality arc welding helmets afford a wide range of selection to meet individual preferences, as follows:

**No. 45-A:** Strong and leakproof, weighing only 15 oz. without lens. Made of best grade, non-warping, black vulcanized fibre. Adjustable chin rest, free-floating wide range headgear.

**No. 80-A LIFT-FRONT HELMET:** Same as No. 45-A, except that it has a lift-front glass holder. Operator may observe work without lifting helmet. Space is provided for extra clear glass. Weight, about 21 oz. without lens.

**No. 25-A:** Compact, form fitting, and well ventilated. Especially designed for close-quarter use. Made of best grade, non-warping, black vulcanized fibre. Adjustable chin rest, free floating wide range headgear. Weight, 16 oz. without lens.

**No. 70:** A lower-priced helmet that is serviceable, well-made, and leakproof. Made of good quality, non-warping, black vulcanized fibre. Adjustable headgear and chin rest. Weight, 14 oz. without lens.

**No. 66:** A moderately priced, leakproof helmet. Leather sweatband, sliding type adjustable headgear. Streamlined design makes it ideal in close quarters. Weight, about 19 oz. without lens.

\*Prices do not include colored plate and cover plate. Prices given above are subject to discount in lots of 12 or more.

## Save Buying Time

use AIRCO'S illustrated price list of  
gas and arc welding supplies

This handy booklet gives prices, sizes and shipping details on Airco's comprehensive line of gas and arc welding accessories. Mail the coupon for your free copy. If you also want facts on Airco Electrodes, indicate request on the coupon.

★ BUY UNITED STATES WAR BONDS ★



M.  
Air  
Reduction  
Sales Co.

60 E. 42nd St.,  
New York 17, N.Y.

Please forward as  
soon as possible:

- ☐ Airco Gas and Electric  
Supplies Price List.  
☐ Airco Electrode Price List.

Name.....

Company.....

Address.....

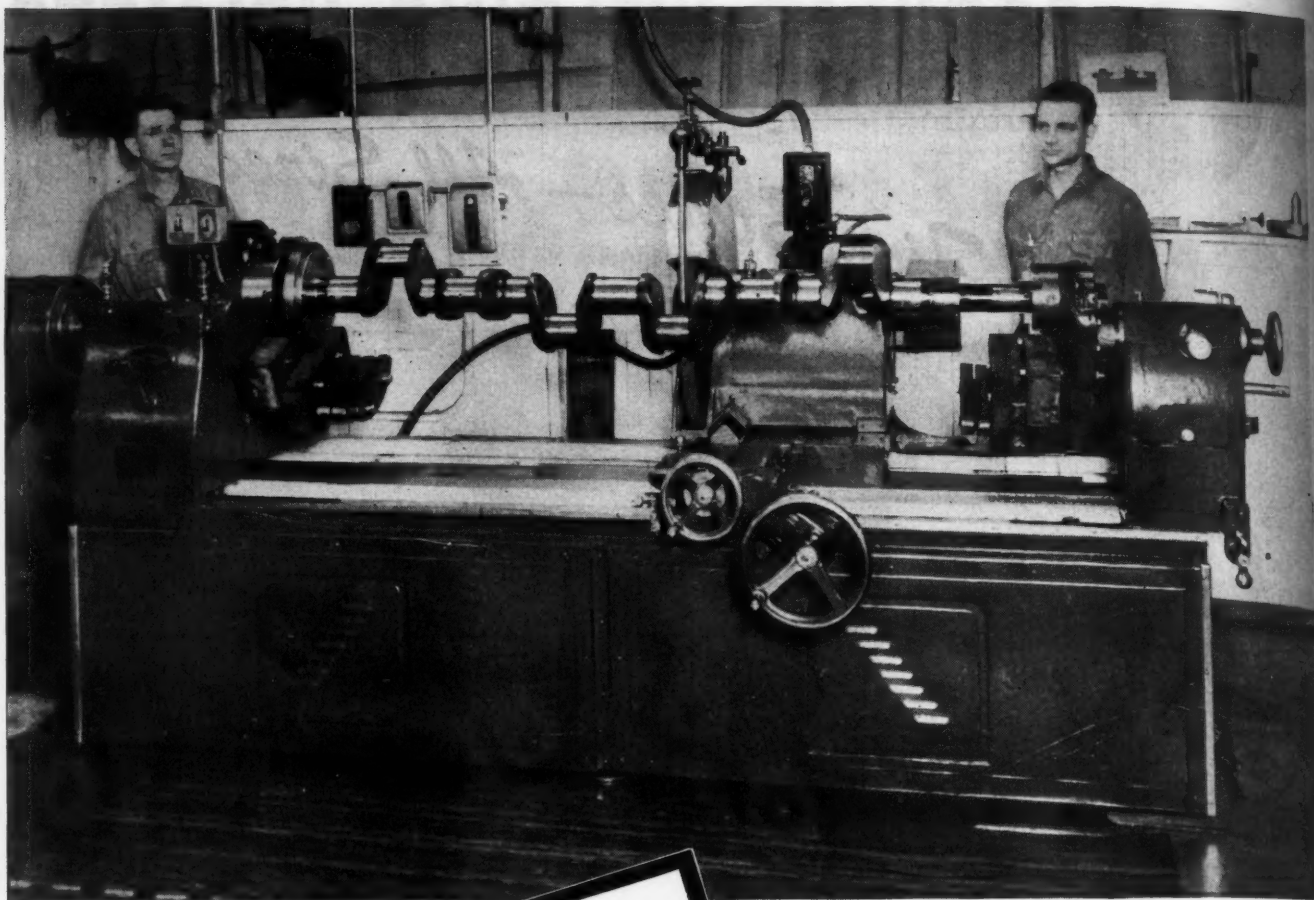
City..... State.....

## AIR REDUCTION

General Offices: 60 East 42nd Street, New York 17, N. Y.  
In Texas: Magnolia Airco Gas Products Co. General Offices: Houston 1, Tex.  
Offices in all Principal Cities







● Built by LEMPCO PRODUCTS, INC.

**Accuracy  
at high  
speeds**



**SKF**  
BALL AND ROLLER BEARINGS

When the crankshafts of airplane engines for bombers and fighters are ground, extreme accuracy at high speeds is essential.

That's why this Lempeco Crankshaft Grinder has an SKF-equipped spindle.

Not only do SKF Bearings maintain spindle rigidity, but combine a silklike finish and an excellent spark-out with smooth operation at low temperature.

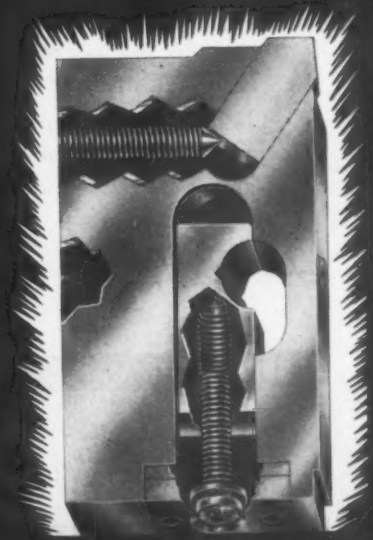
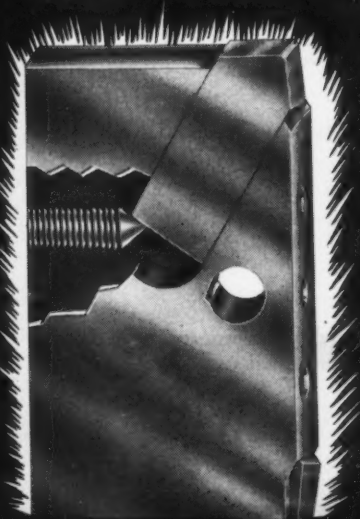
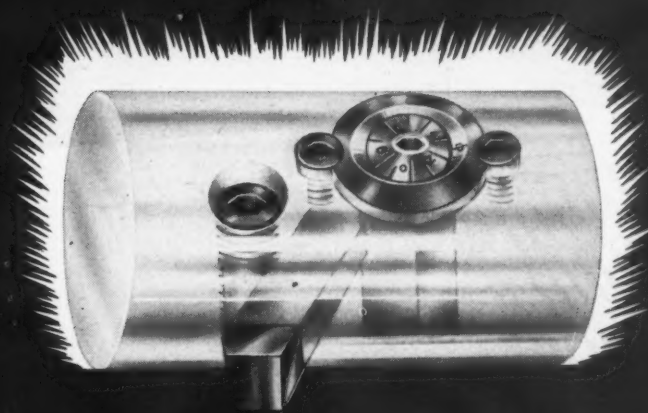
An SKF-equipped grinder is always a grinder that's well-engineered for precision work.

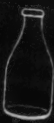





5599

**SKF INDUSTRIES, INC. • FRONT ST. & ERIE AVE. • PHILADELPHIA 34, PA.**  
270—MACHINERY, August, 1944

# DAVIS

*Set New Records for  
Accuracy and Economy!*



*If you want to move bottles*   
*or bullets*  ... *tugboats*   
*or trucks*  ... *movies*   
*or machine tools*  ...

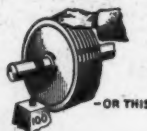


In fact, to transmit power to almost any application, the odds are that you can do it most efficiently with Morse Roller or Silent Chain Drives. Because they can't slip, Morse Chains, designed to the job, are ideal for conveyor use, moving bottles surely and accurately to filling and sealing stations. Because they're flexible and deliver power at practically 100% efficiency, Morse Chains have been widely accepted for marine reduction and power transmission usage in U. S. Navy craft . . . and for direct power transmission on trucks.

Selected for the accuracy and precision with which they transmit motion, Morse Chains are used to turn the spools of movie projectors, to operate machine tools.

For the design engineer who thinks ahead, Morse Chain can open new vistas . . . as a flexible, precise means of transmitting power, without power loss, with exceptional accuracy. Consult your nearby Morse man about power transmission problems large or small.

*Here's Why -*



**Teeth Not Tension**

SPROCKETS

CHAINS

FLEXIBLE COUPLINGS

CLUTCHES

**MORSE** *Roller and silent* **CHAINS**

MORSE CHAIN COMPANY • ITHACA, N. Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY





American machine tools have played a leading role all over the world in beating the Axis at its own game of mechanized warfare. . . Heavy-duty lathes are out in front in this production war. . . *Axelson Lathes* are in the blue-ribbon class for they have come by their recognized merit through more than thirty years of constant improvement. . . At no period in history have lathes been called upon to deliver such fast precision metal turning on heavy schedules as during this global war. . . *Axelson Lathes* have come through with flying colors for speed, versatility, precision, durability and low maintenance. . . In the vast reconstruction that will follow Peace, *Axelson Lathes* are ready to go on to new triumphs of performance. . . These triumphs will be assured by the scrupulous engineering and craftsmanship which blend with metallurgical science in Axelson lathe construction.

*AXELSON LATHES, of various lengths, are manufactured in 14, 16, 20, 25 and 32-in. sizes*



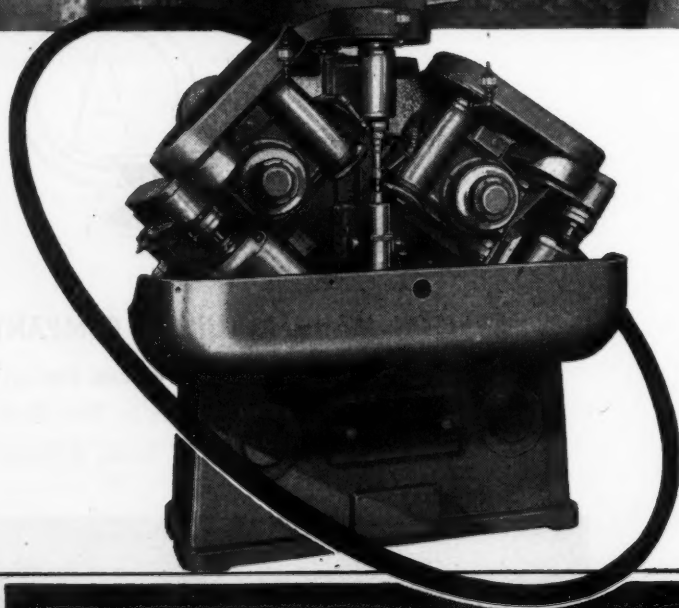
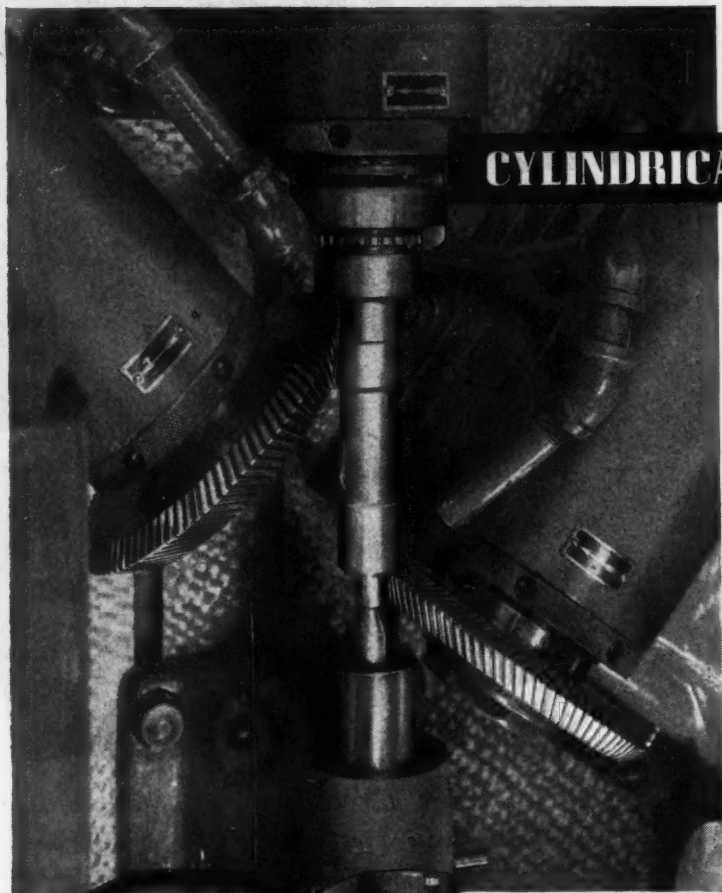
#### **AXELSON MANUFACTURING COMPANY**

6160 Boyle Avenue, (Box 98 Vernon Station)  
Los Angeles 11, Calif. • 50 Church St., New York  
City • 3844 Walsh Street, St. Louis, Missouri

# AXELSON LATHES

*Dependable for over  
a Quarter Century*

# ROTO SHAVING



*Finishes*

CYLINDRICAL and CONICAL SURFACES

*Faster and*  
*Better*

On parts having a hardness of 38 Rockwell or less, Roto Shaving is better than grinding because it is faster, more economical and the finished surfaces can be maintained to a high degree of smoothness. Production rates are about three times that of grinding.

A 100% complete inspection of a lot of 4,000 consecutive pieces reveals a maximum variation of .001" on the diameters. Stock removed ranges from .010" to .015" on the flanges and .020" on cylindrical diameters.

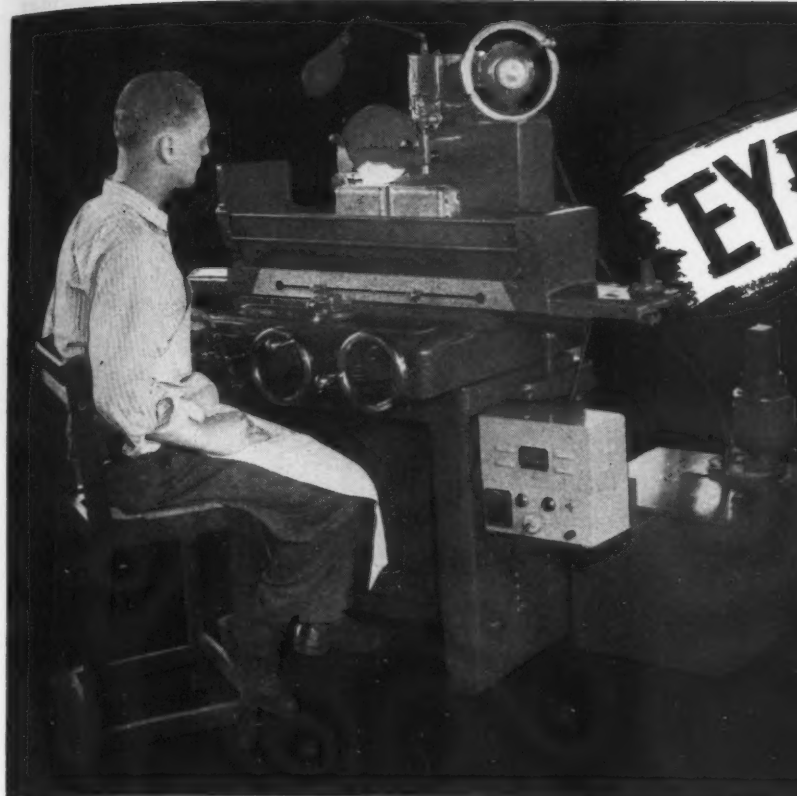
A special fine pitch milling cutter is used for this work and the work is rotated during the cut but at lower speeds than for grinding. These cutters wear very slowly and may be sharpened on ordinary shop equipment. The gradual wear materially reduces machine adjustments.

NATIONAL BROOK  
AND MACHINE CO.

RED RING PRODUCTS

*Specialists on* SPUR AND HELICAL  
INVOLUTE GEAR PRACTICE

*Originators of* ROTARY SHAVING  
AND ELLIPTOID TOOTH FORMS



# EYE-OPENER

## Do ALL

Tool room precision finishes with a production grinder—surfaces ground to such close tolerances that you can measure them in micro inches—that's what the DoALL offers.

You'll like its quiet, vibrationless performance, its ease of operation. Designed so operator can sit and watch the work at close range without eyestrain or physical discomfort.

And—here's the interesting, modern auxiliary equipment available for use with the DoALL:

**MAGNETIC CHUCK.** Holds work firmly in place with variable amount of magnetic force.

**SELECTION.** Controls chuck power, demagnetizes chuck, rectifies current, etc.

**COOLANT UNIT.** Steady flow of 1 to 30 gallons per minute.

**DUST COLLECTOR.** Keeps work and table free from dust.

**GRINDING WHEELS.** Perfectly balanced. Various abrasives and grains. Sizes 7 and 10" diameters.

*It will Pay you to Investigate the DoALL now.*

**Send for Illustrated Literature.**

*4.2 R. M. S.  
Guaranteed  
Surface Finish*

*OVER 600 SQ. IN.  
of Bearing Area*

*VIBRATION  
Cut to Minimum*

*DIRECT  
Hydraulic Drive*

Contour Sawing



Band Filer



Super  
Surface Grinders



Grinding Wheels



Colloidal  
Cutting Oils



Dust  
Collectors  
and



Variable Speed  
Pulleys



Band  
Saws



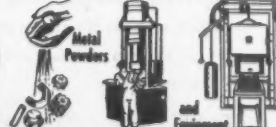
Band  
Files



Inspection Laboratory  
GAGE BLOCKS



POWDER METALLURGY



# DoALL

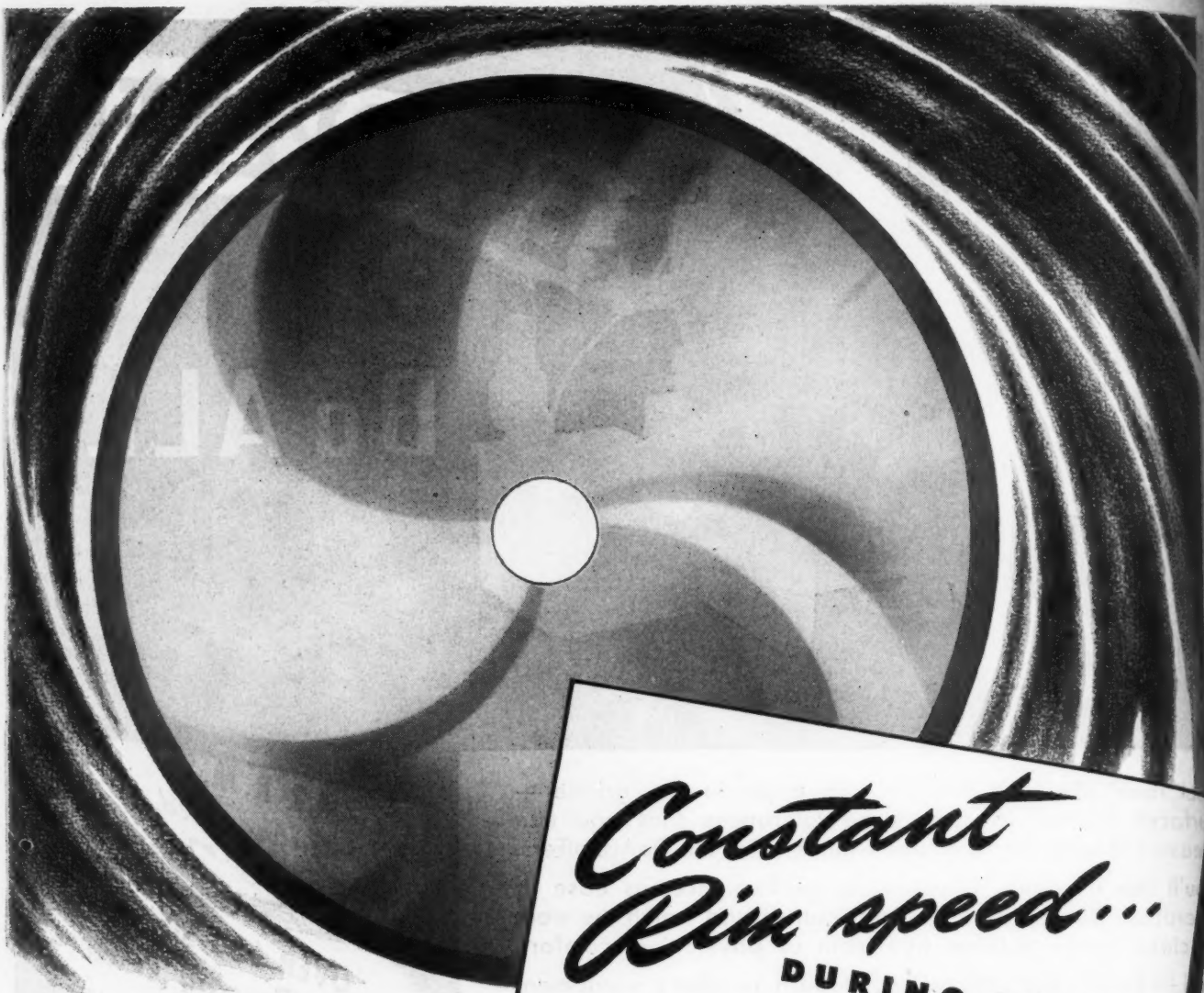
INDUSTRY'S NEW SET OF TOOLS

**CONTINENTAL MACHINES, INC.**

1312 So. Washington Avenue • Minneapolis 4, Minn.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa, West Hartford.





*Constant  
Rim speed...*  
**DURING ENTIRE  
WHEEL LIFE!**

## **DI-MET DIAMOND WHEELS**

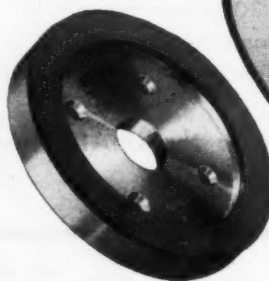
**D**I-MET Diamond Wheels give you fast cutting, efficient service on all grinding and cutting-off operations where use of diamond wheels are practical\* because rim speeds show negligible change during entire wheel life... grinders with fixed spindle speeds, therefore, maintain their full efficiency from the time the wheel goes on the machine until its long, useful life is ended.

This slow-wearing rim has other advantages too—it makes precision easier to maintain from end to end on cylindrical or surface grinding, it simplifies obtaining uniform dimensions on multiple-toothed cutters without time wasted for individually indicating cutter teeth or for making constant machine infeed adjustments to compensate for wheel wear.

DI-MET Diamond Wheels lower down time for tool maintenance, cut fast and free, will not craze fragile carbide surfaces, produce much keener cutting edges than ordinary abrasives. Our catalog shows prices and sizes of all standard DI-MET wheel types—write for your free copy without delay!

**FELKER MANUFACTURING CO.**  
1113 BORDER AVENUE, TORRANCE, CALIFORNIA

Resinoid Bond



Metal  
Bond



Rimlock  
Type CR



\*  
**DI-MET DIAMOND WHEELS ARE MADE IN 3 BONDS:**

**RESINOID BOND**—for rapid grinding and cutting-off on all types of sintered carbides.

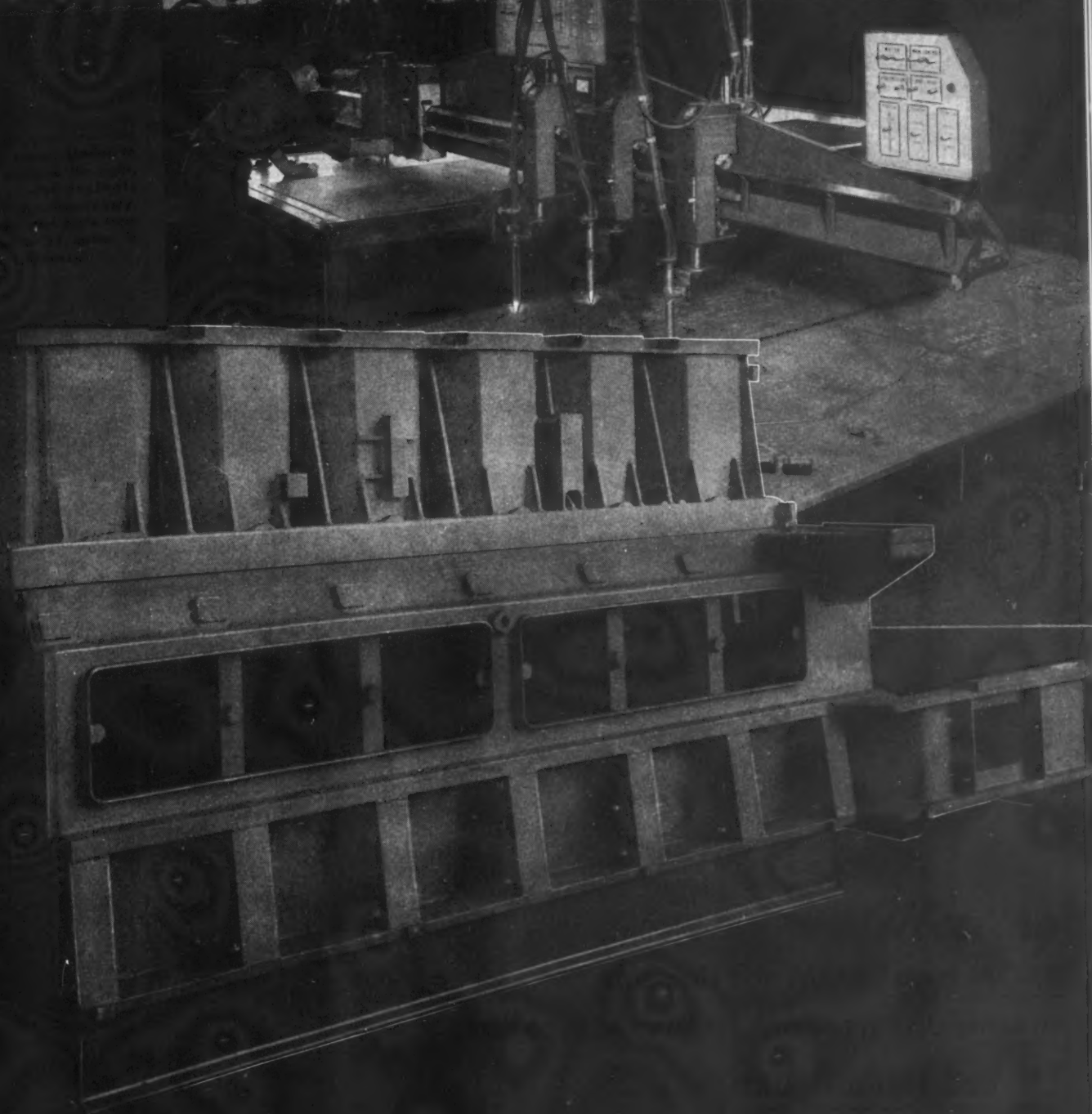
**METAL BOND**—for grinding all types of sintered carbides and non-metallic materials with exceptionally long wheel life and ability to hold rim shape.

**RIMLOCK & TYPE CR**—for cutting off, grooving and milling non-metallic materials such as glass, porcelain, quartz, clay products, vitrified materials, asbestos-cement, concrete, other similar substances.



**MANUFACTURERS OF DIAMOND ABRASIVE WHEELS**

# MAHON *Fabricated* WELDMENTS



THE R. C. **MAHON** COMPANY  
DETROIT II CHICAGO 4

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS



**HUDSON**  
Douglas Aircraft

**CROSLLEY**

MINNEAPOLIS-MOLINE POWER IMPLEMENT

**CRUCIBLE STEEL**  
**CHRYSLER**



**BUICK**

BORG-WARNER

**CATERPILLAR TRACTOR**  
D. O. JAMES MANUFACTURING CO.

INTERNATIONAL HARVESTER

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AMERICAN CAN CO

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SAVAGE ARMS  
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**REPUBLIC**  
*Aviation*

TELETYPE



Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

# LAKE SHORE

## TOOL WORKS INC.

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS

278—MACHINERY, August, 1944

COUNTER BORERS • REAMERS • STANDARD END MILLS AND MILLING CUTTERS FROM STOCK • SPECIAL CARBIDE TIPPED TOOLS





16-ton Hannifin hydraulic press at plant of Wright Aeronautical Corporation

## Keeps marking uniform

This operation of marking numbers on aircraft engine connecting rods makes full use of the advantages of Hannifin hydraulic press design. The smooth application of pressure, and automatic reversal of the ram at a predetermined uniform maximum pressure, insures uniform marking of successive pieces, compensating for small variations. The operator can produce accurate work rapidly and easily.

Maximum ram pressure is

adjustable, making this press easily adaptable to a variety of work. Ram stroke is also adjustable, to avoid unnecessary up-travel in production operations.

Hannifin hydraulic presses are built in a wide range of standard types, 5 tons to 150 tons, for straightening, forming, press-assembly, and simi-

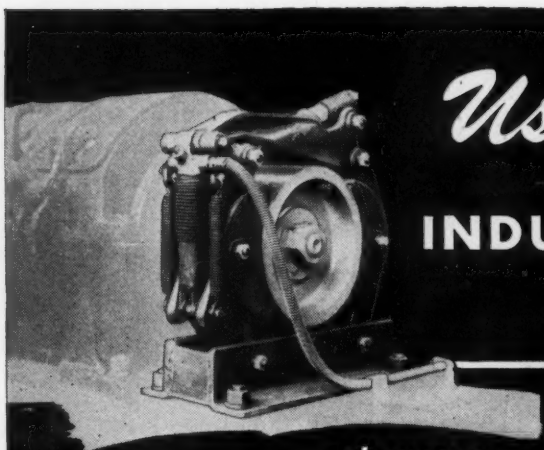
lar work. They are being used in modern manufacturing operations by producers of aircraft, engines, machine tools, military vehicles and armament. Write for press bulletins or consult Hannifin engineers for specific recommendations.

**HANNIFIN MANUFACTURING COMPANY**  
621-631 South Kolmar Avenue • Chicago 24, Illinois



**HYDRAULIC PRESSES**

*Hannifin*



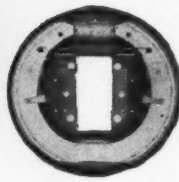
# Use **Wagner**

## INDUSTRIAL BRAKE CONTROLS

*wherever  
industrial machinery must be stopped  
quickly, safely, and smoothly*

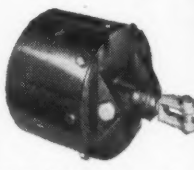
A typical crane bridge-braking system as used on overhead cranes is illustrated. It consists of an external brake, which is actuated by a foot-operated master cylinder. The same system has been successfully applied to other machines, such as bending-rolls, scrap-balers, large wheel-balancers, and similar applications depending on foot pressure to decelerate the machine for either normal or emergency stops.

Wagner manufactures many other brake controls which may be applicable to your machines. These may be either air or hydraulically actuated. A general idea as to what these controls are may be obtained by referring to the illustrations shown on this page. However, types of applications for dependable brake control are numerous and very often difficult to determine. We suggest that you consult us and benefit by the recommendations of our trained and experienced brake engineers.




### TYPICAL WAGNER LOCKHEED INTERNAL BRAKE

A typical Wagner Lockheed internal brake assembly. Available in various sizes for application to some types of industrial machinery. Wagner engineers will advise you whether this type of brake can be applied to your machinery.



### AIR CYLINDER

This Wagner air power-cylinder assembly converts the energy contained in compressed air into mechanical force, which (through linkage) expands the brake shoes in mechanical brake systems or actuates the hydraulic master-cylinder in air-hydraulic brake systems.



### HYDRAULIC ACTUATOR CYLINDER

One of several types of hydraulic actuating-cylinders which transforms the hydraulic-fluid pressure into the mechanical force needed to apply the brake shoe against the brake wheel or drum.



### MOTOR and BRAKE UNIT

Each unit is equipped with an internal expanding shoe-type brake that is applied by hydraulic pressure developed in a foot-operated master-cylinder.




### POWER CLUSTER

The Wagner Power Cluster simplifies the application of air power to hydraulic brake systems. It consists of a standard air power-cylinder assembled directly to a standard hydraulic master-cylinder. It produces desired hydraulic line-pressure by varying the air pressure without the use of levers or linkage.



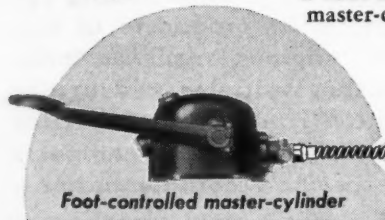
### AIR COMPRESSOR

The function of this unit is to develop and maintain sufficient compressed air in air reservoir to operate air-brake system and other air-powered accessories.



### TYPE HM BRAKE

Wagner Type HM Hydraulic Industrial Brake is intended for use on overhead cranes, whirler cranes, coke pushers, lorry cars, door machines, and transfer cars which require a parking brake when out of service or while performing their principal functions.



Foot-controlled master-cylinder

TELL US YOUR PROBLEMS

144-13



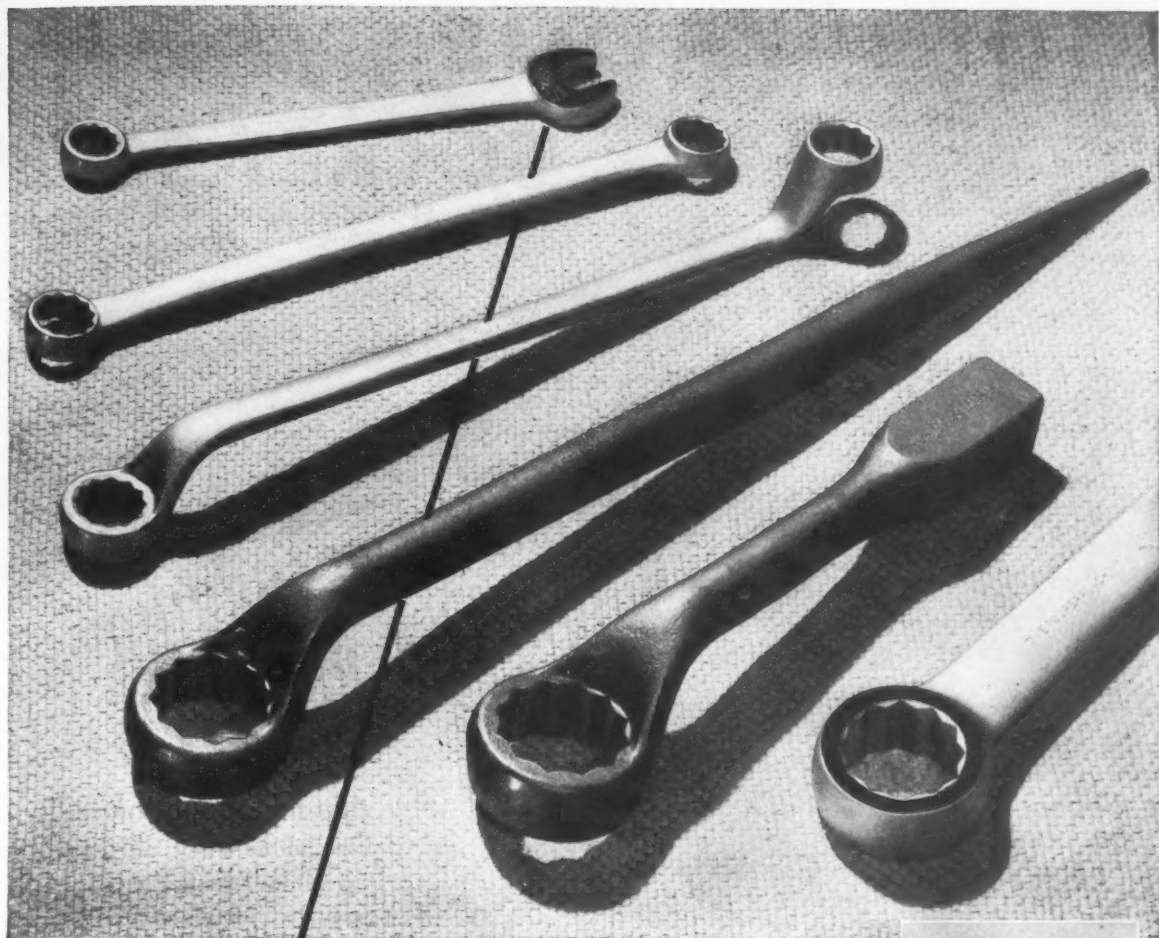
# Wagner Electric Corporation

ESTABLISHED 1891

6467 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS



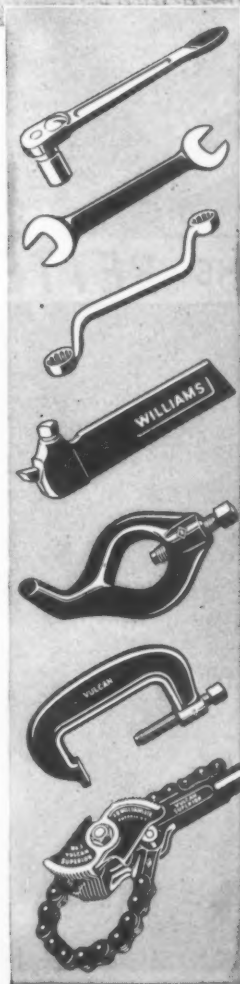


# Arms for Industry

BACK OF THE ALLIED FIGHTING MAN  
are new and deadlier weapons born of American  
technical skill. Back of this creative genius are the  
tried and able tools that arm free industry . . . that  
make America invincible on the field of battle and  
in the marts of trade.

J. H. Williams & Co.,  
Buffalo 7, New York.

**WILLIAMS**  
DROP-FORGINGS AND  
DROP-FORGED TOOLS





# HOLO-KROME *fibro forged* SOCKET SCREWS



**INTERNAL WRENCHING**  
**QUICK and POSITIVE**

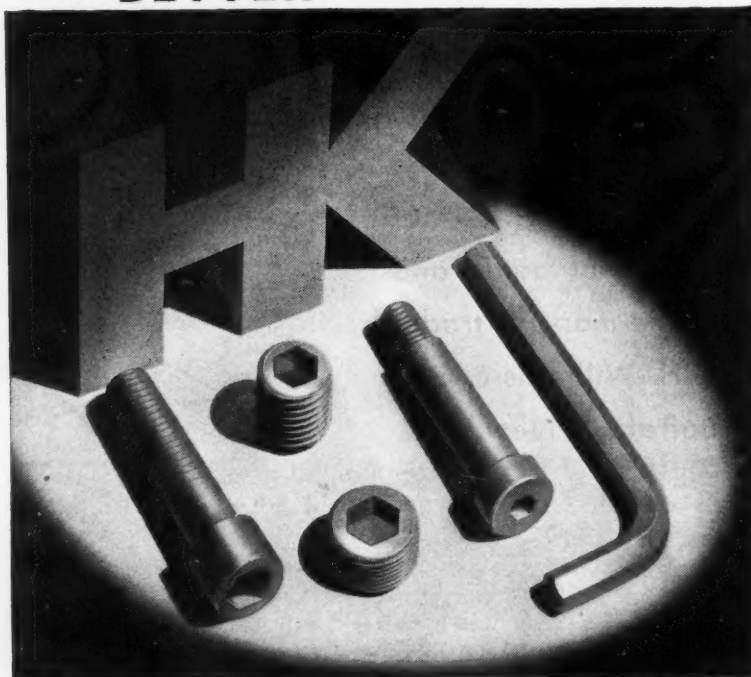
HK

SOCKET  
SET  
SCREW

## Assembly Time Reduced!

One of the many advantages gained by using Holo-Krome FIBRO FORGED Socket Screws with the Internal Wrenching feature. The Hex. Key engages the socket quickly. Permits a positive tightening job... More compact design in parts, machinery and machine tools, materials used efficiently, space used to full usefulness and again, Assembly Time Reduced! . . . . . It's the Holo-Krome Internal Wrenching feature.

THE **BETTER** FASTENING METHOD



## PRECISION MADE TO EXACTING STANDARDS

SOCKET HEAD CAP SCREWS... SOCKET  
SET SCREWS . . . SOCKET PIPE PLUGS  
SOCKET HEAD STRIPPER BOLTS...  
SOCKET SCREW KEYS & KEY SETS

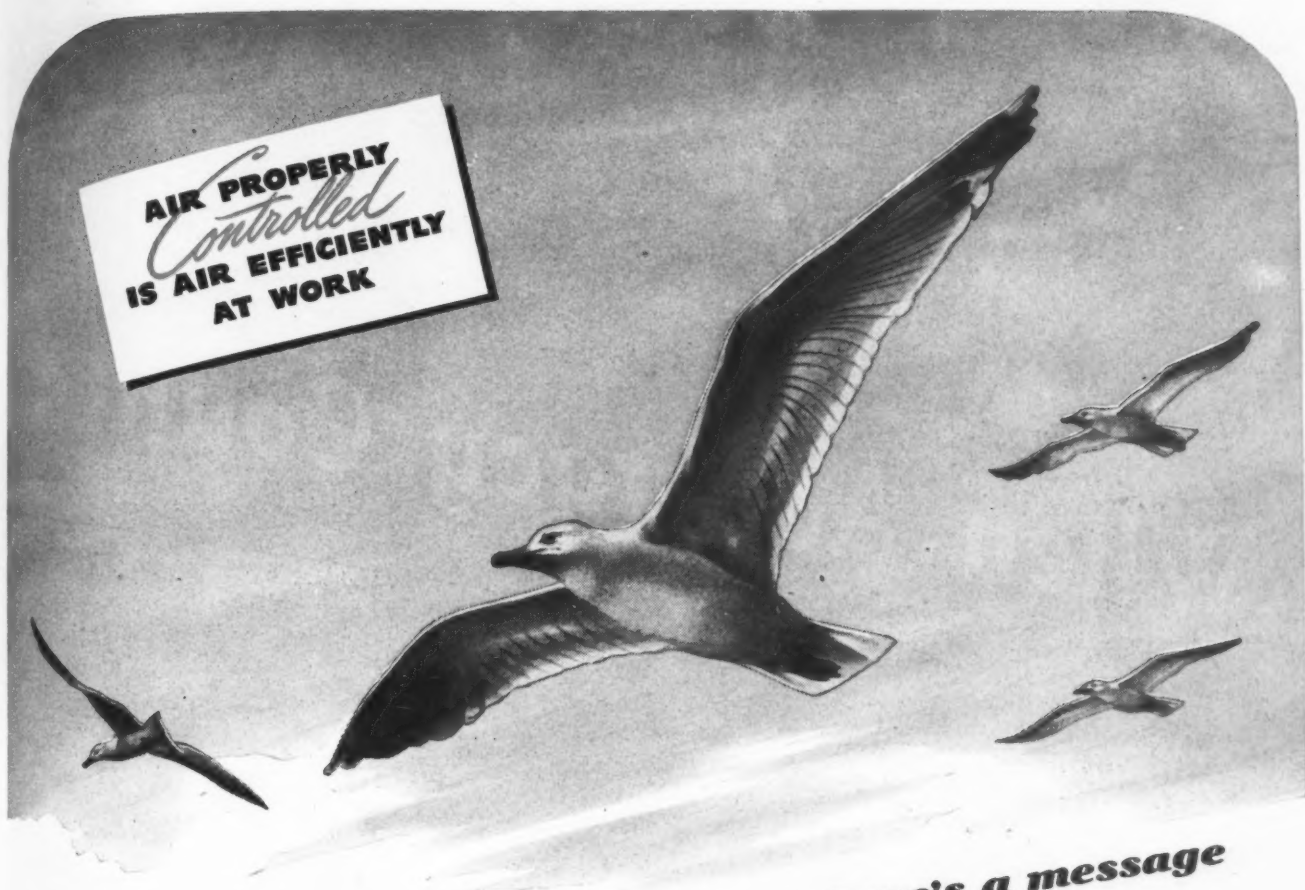
**GUARANTEED UNFAILING PERFORMANCE**

The **HOLO-KROME**  
**SCREW CORPORATION**

*Main Offices & Plant*

HARTFORD 10, CONN., U. S. A.

**AIR PROPERLY**  
*Controlled*  
**IS AIR EFFICIENTLY**  
**AT WORK**



**though he's not a carrier pigeon, there's a message**  
**"up his sleeve"**

You are looking at a bird who knows how to go places and do things with natural air.

You, too, can do many things with air...compressed air. And you can do them cheaply, quickly, safely, and effectively if that air is properly controlled.

Years ago, Schrader dispelled the old bugaboo of air losses, substituting controlled, intermittent blasts for wasteful constant flow. Since then Schrader has developed hundreds of devices for the control and use of air. So saving are these devices that you can often multiply your jobs for air *without* adding to your compressor capacity.

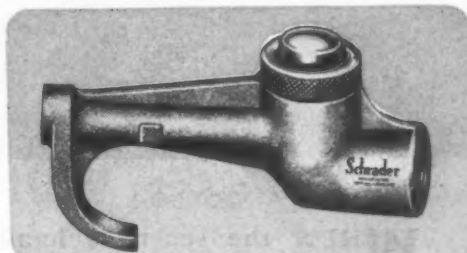
Two of the many Schrader contributions to air power are Blow Guns and Air Couplers. All Schrader blow guns and air couplers shut off automatically and instantly when released, conserving high pressure air. For all the advantages of Schrader blow guns and air couplers, write in for Bulletin A-12E.



Air Valves 2, 3, 4-way • Machine Operating Air Controls • Quick-acting Couplers • Blow Guns • Safety Operating Controls • Air Ejection Sets • Hydraulic Gauges



MADE BY THE MAKERS OF SCHRADER TIRE VALVES AND GAUGES



**TOP:** Drop forged stainless steel blow gun, one of numerous Schrader types. Drop-tested from 11-story building for ruggedness. 8 different interchangeable noses available.

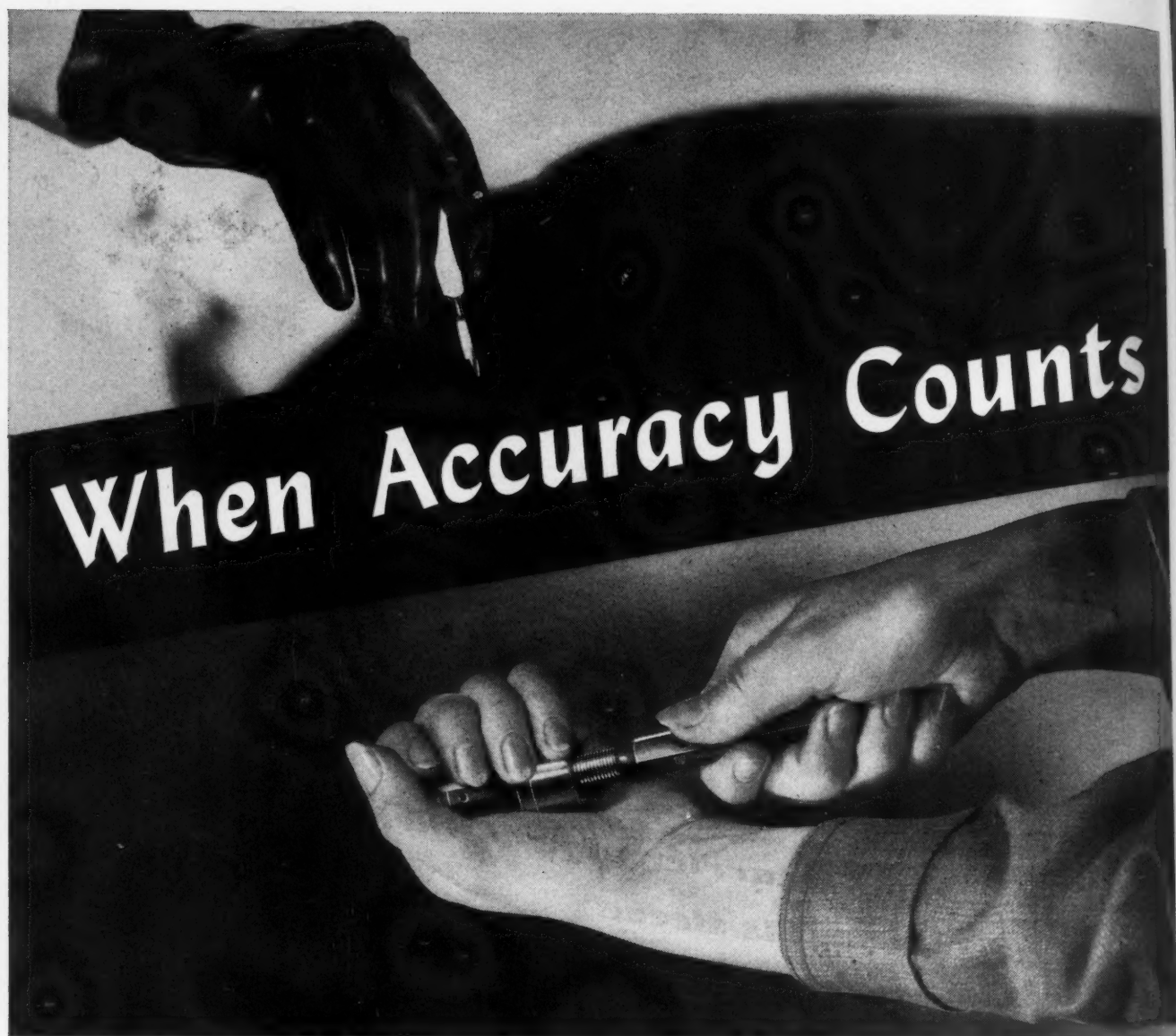


**BOTTOM:** Schrader Heavy Duty Air Line Coupler, quick acting, air tight, automatic shut-off.

**Schrader**  
REG. U.S. PAT. OFF.  
**CONTROLS THE AIR**

**A. SCHRADER'S SON, Division of Scovill Manufacturing Company, Incorporated, BROOKLYN, NEW YORK**

MACHINERY, August, 1944—283




**W**HEN the sensitive hand of a world famous surgeon grasps his scalpel and with a deft stroke, makes an incision, that is when accuracy counts. When the inspector gages a component of a bomber engine, that is when accuracy counts. The very lives of our pilots and air gunners often may

depend on the accuracy of the gage.

Woodworth gages are accurate . . . fashioned to astronomically close limits, Woodworth gages are dependable . . . reduce production costs by their long service life . . . Woodworth gages possess "Accuracy You Can Trust."

Write or wire for catalog 44-G today.

ACCURACY YOU  CAN TRUST

# WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING





## *The Men that Know "HOW" and "WHY"*

**PUT OUT MORE PRODUCTION . . . WITH LESS WASTE !**

### **HAND BOOK OF SPECIAL STEELS**

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 136 pages, pocket-sized, latest data.

**SEND FOR  
YOUR COPY**

Address Dept. M-24



**T**HE special high-alloy steels take more knowing than ordinary materials, that's sure. But they also *give* you more—so much more that their uses have taken one of the steepest upward climbs of any class of materials in recent years.

Electric furnace steels are on the march. Our principal special steel products—corrosion and heat-resisting alloys, tool and die steels, electrical, valve and nitriding steels—have been among those in keenest demand for war use. They're also products which offer you the greatest future promise.

As pioneers and originators in these fields, we have the data your

engineers and designers need, and the working information for your shopmen to handle special steels well and speedily. Let us help you.

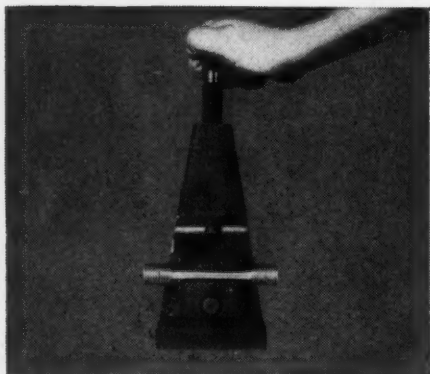


**Allegheny Ludlum  
STEEL CORPORATION**

GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D M-9332

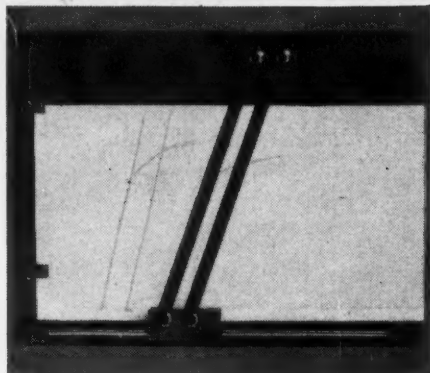
# 3 helpful time-savers for the LABORATORY



## GAGE POINT PUNCH

1.

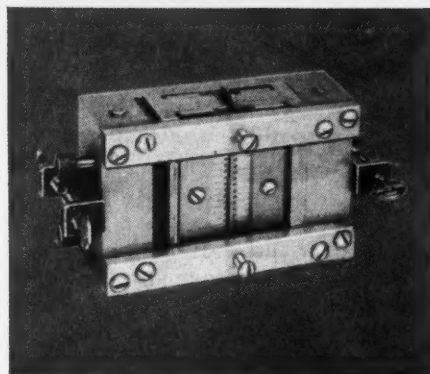
Time-Saver No. 1 . . . automatically centers either round or flat specimens. Marks four uniform 2-inch gage-length centers with one push of the handle. Automatically adjustable to suit soft or hard materials. Accommodates rounds  $\frac{1}{8}$ " to  $\frac{3}{4}$ " dia.; flats  $\frac{1}{2}$ " to  $\frac{3}{4}$ " wide and zero to  $\frac{3}{4}$ " thick.



## PARALLEL RULER

2.

Time-Saver No. 2. This parallel ruler assembly facilitates and simplifies the rapid determination of yield strength, and data from stress-strain curve.



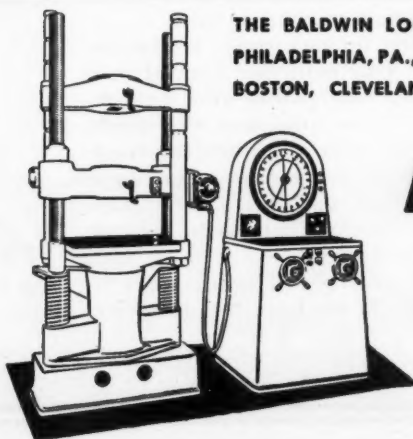
## EDGE-COMPRESSION TESTING JIG

3.


Time-Saver No. 3. This simple inexpensive new jig permits direct determination of compression yield strength from a single test sheet, rather than use of a pack. Simplifies testing technique.

### BALDWIN PRODUCTS

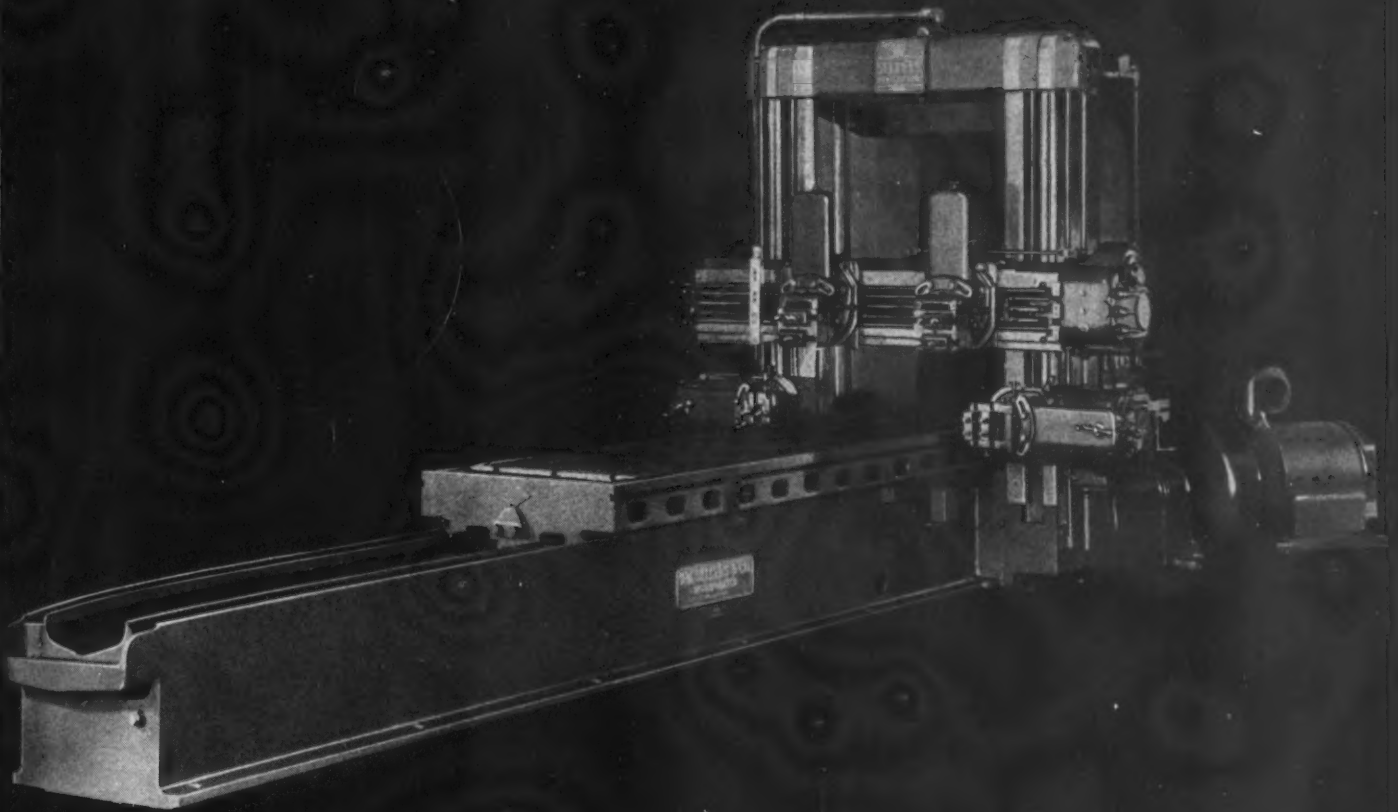
Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.



THE BALDWIN LOCOMOTIVE WORKS, BALDWIN SOUTHWARK DIVISION, PHILADELPHIA, PA., U.S.A. OFFICES: PHILADELPHIA, NEW YORK, WASHINGTON, BOSTON, CLEVELAND, CHICAGO, ST. LOUIS, HOUSTON, SAN FRANCISCO

**BALDWIN**   
SOUTHWARK  
TESTING EQUIPMENT





And like the woodsman's renowned skill with his Kentucky rifle, the Sellers **Power-Flow Planer** matches its ruggedness with extreme **ACCURACY**—an accuracy seldom encountered in a machine tool of such size and capacity.

When production schedules are "impossible" and tolerances rigidly close you can bank on the Power-Flow for fast, continuous, ultra-precise work... Nearly a century of "Precisioneering" on machine tools exclusively are behind it.

If higher output at lower cost is your responsibility write for the new Power-Flow catalog which will acquaint you fully with the design and operating principles of this unusual machine . . . Wm. Sellers & Company, 1612 Hamilton St., Philadelphia, U. S. A.

© 1943, Wm. Sellers & Co.

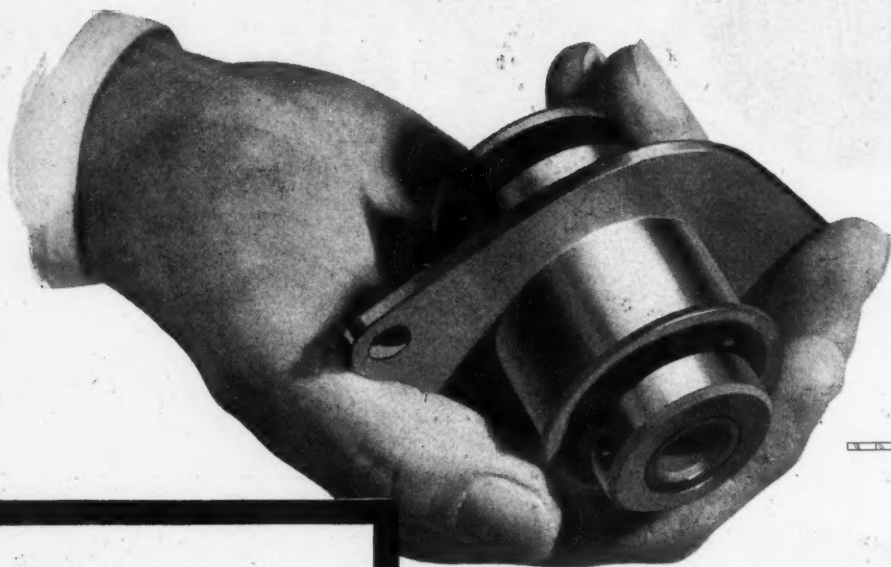
**SELLERS**

**PRECISIONEERING SINCE 1848**

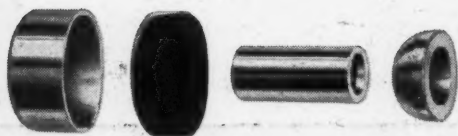


# Take the "X" out of Rubber Mounts

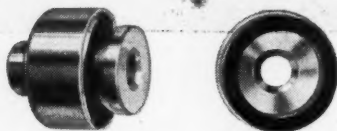
(Where X is the UNKNOWN Rate of Deflection)



Silentbloc shear-type mounts and bearings are simple to incorporate in designs.



These parts of a Silentbloc, before assembly, show why it is different from all other rubber mountings. Rubber ring is inserted under high pressure into outer tube. Inner sleeve (or solid shaft) is "shot" with extreme force through inner diameter of rubber. All parts can be varied to achieve exact performance needed.



Comparison of this completed Silentbloc with unassembled parts shows how rubber is elongated and compressed. Any kind of rubber, synthetic, natural or reclaimed, and any kind of metal can be used. Inner metal member can be sleeve or bearing type, or solid shaft threaded or grooved. Natural pull of live rubber makes adhesion of rubber-to-metal virtually indestructible.



## Design with Engineered GENERAL SILENTBLOC

Of course rubber is resilient. But *how* resilient—what's the rate and direction of deflection?

You can remove that X with General Silentbloc. These shear-type rubber mountings, bearings and couplings can be *engineered* by our skilled staff to give the exact performance your job requires. If you know the rate of deflection needed, we can design a Silentbloc to *match* that curve.

Such precise control is made possible by the patented Silentbloc principle of elongation and confinement of rubber. By variation of size and design of the fitting, kind of rubber, the degree of elongation of the rubber and distortion of its outer and inner diameters, Silentbloc mountings and bearings can be engineered to:

- Provide soft cushioning for axial load but maintain rigidity to radial or conical loads, or vice versa
- Snub at either or both ends for shock loads
- Allow a wide controlled amplitude of torque action
- Exert greater pressure on the outer or inner diameter
- Control deflection under increasing load.

These are a few examples—the variations of Silentbloc are almost unlimited. They are used today in many fields—automotive, aviation, industrial and domestic machinery, electrical and electronic equipment, marine equipment and others.

You can improve your products with Silentbloc to control vibration, isolate parts, insulate against foreign vibration, give torque action, correct against bearing or mounting misalignment. For factual literature, write The General Tire & Rubber Company, Dept. 51, Wabash, Indiana.

**THE GENERAL TIRE & RUBBER CO.**  
Mechanical Products Division, Wabash, Indiana

# VARIABLE SPEED

operation offers tremendous advantages on many applications and this is especially true if you secure your variable speed operation with Master Speedrangers.

The speed varying mechanism is a steel on steel drive which is built into an integral construction with the motor to form an extremely compact, durable, trouble-free unit.

Master Speedrangers are available for every current specification, every type enclosure, with gearheads, unibrakes . . . and in the whole wide range of types in the Master Line. This wide flexibility makes it easy to select just the right combination of features for each application.

The unit shown below is ideally suited to the job as it provides smooth, stepless operation to as high as 5000 RPM without the use of gears, etc. . . . saves space, saves parts, only one unit to mount, fully enclosed for complete safety . . . equipped for manual remote control operation.

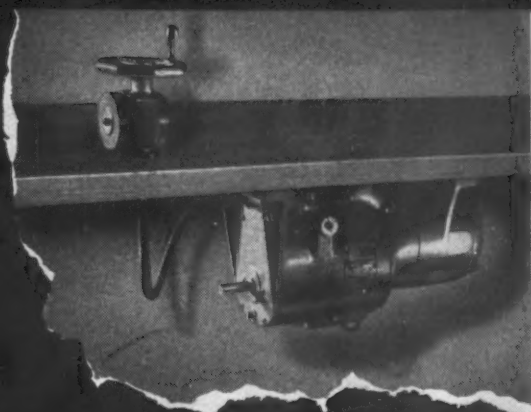
The complete Speedranger is designed, manufactured and guaranteed as a unit in one plant by one manufacturer, so there is no division of responsibility for its satisfactory operation.

Investigate how easily you can secure the many advantages of variable speed operation if you use Master Speedrangers.

THE MASTER ELECTRIC COMPANY  
DAYTON 1, OHIO



## SPEEDRANGERS



# KILL

## ALL HIDDEN SNIPERS!



Along your production lines there are snipers that are just as hard to spot as those along the jungle battle lines. These are the "little" errors, shortages, and almost imperceptible mechanical slowdowns which add up to serious losses and delays in production. And these hidden snipers can't be killed off unless you can spot them and get a true sight on them with running records of machine-performance.

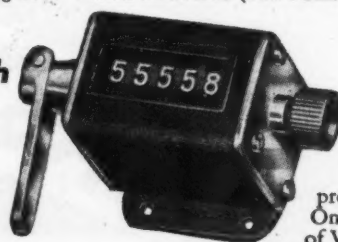
Such records are provided uninterruptedly by Veeder-

Root Counting Devices, made in types and sizes that can be readily installed on any production machine. Then you can spot trouble *as soon as it begins to happen* and take immediate steps to correct it before final assembly is tied up and shipments to the fighting fronts slowed down.

**VEEDER-ROOT INCORPORATED, HARTFORD 2, CONN.**

*In Canada:* Veeder-Root of Canada, Ltd., Montreal  
*In England:* Veeder-Root Ltd. (new address on request)

**Protect against Production-Losses with  
 VEEDER-ROOT COUNTING DEVICES**



Small Reset Ratchet Counter for small production machines. One of scores of Types of Veeder-Root devices.





# Precipitron

**KEEPS AIR FROM "SCRATCHING"**  
**SUPERFINISHED SURFACES**

**A NEW PRINCIPLE FOR CLEANING AIR**

*Dirt, smoke and soot—*

*passes through an electrostatic field*

*receives a positive (+) charge*

*and is drawn to a collection plate of opposite polarity (—)*

*where it remains until flushed down the drain.*



Scratching superfinished surfaces means costly rejects. Air-borne dust and dirt can cancel the productive results of irreplaceable man-hours, increase costs and waste precious materials.

Precipitron\* is your protection against this damage. This Westinghouse electronic method of cleaning air is the most efficient yet developed—90% more effective than mechanical methods. Precipitron removes foreign particles as small as 1/250,000 of an inch. Even tobacco smoke, most difficult of all air-borne matter to remove, is effectively captured on Precipitron collector plates.

If protection for your precision work calls for *clean* air be sure to get all the facts about the Precipitron. Full details of its application and low-cost operation can be obtained from your nearest Westinghouse office. Or, write Westinghouse Electric & Manufacturing Co., Dept. 7-N, East Pittsburgh, Pa. J-04007

\*Trade-mark registered in U. S. A.

## Westinghouse Precipitron *the Electronic Air Cleaner*

PLANTS IN 25 CITIES OFFICES EVERYWHERE

MACHINERY, August, 1944—291

# Off-Hand Grinding



Dumore 77F Grinder  
used for off-hand  
sharpening of  
rotary files.



**STABILITY OF DUMORE MAKES IT  
PREFERRED EQUIPMENT  
FOR SPECIALIZED PRODUCTION**

Manufacturing and regrounding of rotary files call for manual skill of a high order. Original spacing of the flutes on the steel blank, and proper profiling and sharpening of the cutting edges, are done *entirely without jigs or fixtures* by a leading manufacturer in this field. Obviously, true and vibrationless grinding is a must! To supplement the skill of the operators with the most accurate equipment available, this com-

pany has equipped every one of its numerous plants, located throughout the country, exclusively with Dumore Precision Grinders and specially mounted Dumore Quills.

A Dumore's vibrationless operation at speeds up to 42,500 r. p. m. and its ability to maintain precision to a tenth ( $\pm .0001$ ") even under arduous production schedules are guaranteed by the advanced engineering design and the exacting manufacturing standards which are the hallmark of Dumore products. Applications of Dumore grinding to work requiring high accuracy and quality finish are seemingly endless! Are you taking advantage of the full possibilities of this versatile tool? Ask your distributor, or write to The Dumore Company, Tool Division, Dept. TH28, Racine, Wis.



**Have you seen Catalog 42?  
Full of helpful information.  
Send for your copy—today!**

## DUMORE

**PRECISION AND  
OFF-HAND GRINDERS**

**SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES**



## Forging Crankcases

The first aluminum crankcases were forged on Erie Steam Hammers but our "E" Flag flies today for the millions of forgings that are now being made on time in Erie Hammers throughout the United Nations. Another "E" Flag flies over the plant of an Erie customer because more than a year ago he developed on an Erie Hammer a new forging technique for making steel crankcases and thereby broke a serious bottleneck in aircraft production. Write for data.

ERIE



**ERIE FOUNDRY COMPANY**  
ERIE, PENNSYLVANIA, U. S. A.

**DETROIT**  
335 Curtis Bldg.

**CHICAGO**  
549 Washington Blvd.

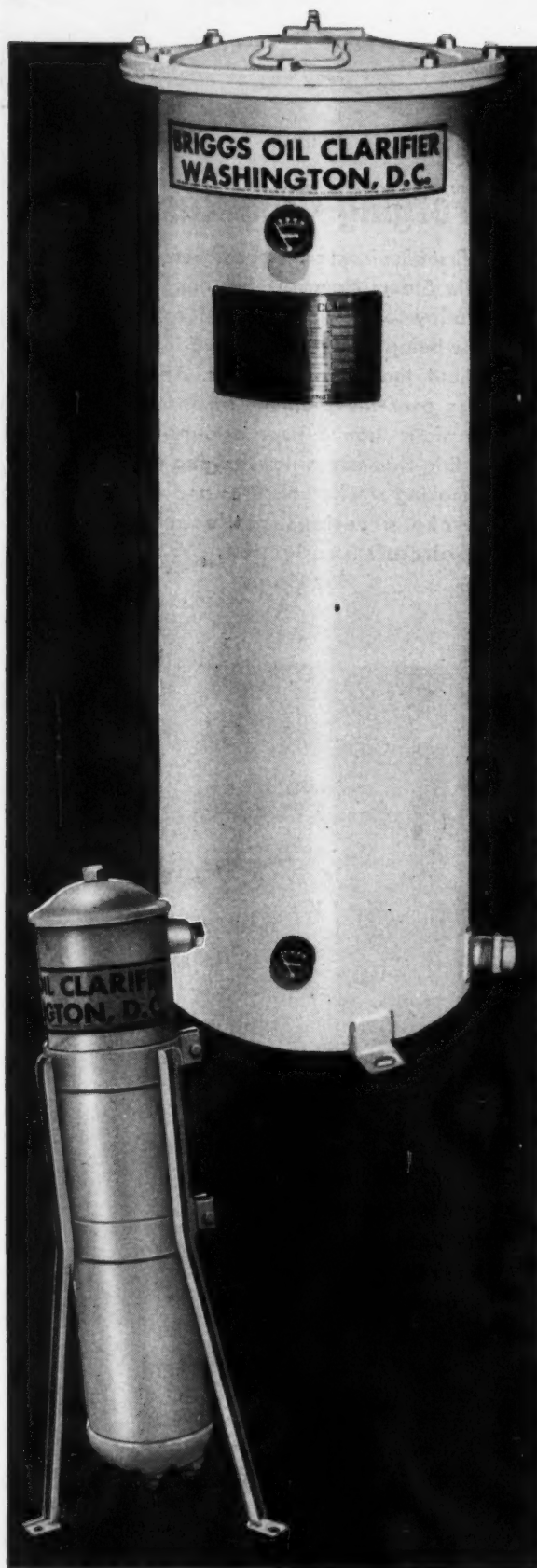
**INDIANAPOLIS**  
335 Postal Station Bldg.

**ERIE BUILDS**

**HAMMERS**



# *A New* **BRIGGS** *Oil Filter*



for continuous filtration of soluble oils,  
low viscosity cutting oils, kerosene and  
cleaning fluids

*used in*  
precision grinding, honing, light broach-  
ing, milling and lathe work where finish  
is important.

This newly-developed Briggs Filter will help you increase production, increase wheel or tool life and improve operating conditions. Because it will maintain the properly selected coolant in optimum condition at the wheel . . . free of metallic and grit particles . . . grinding and honing to desired tolerance and finish is readily accomplished.

In one plant, this filter reduced rejects from 60% to 12% . . . a daily saving of more than the cost of the filter. In another, normal coolant life of two to three days was increased to seven to ten days.

Get all the facts about the Briggs ZR Filter. Learn how clean coolants will contribute to higher production and lower operating costs.

*Consult the Briggs distributor in your territory  
or write manufacturer for informative folder.*



**BRIGGS CLARIFIER COMPANY**  
WASHINGTON 7, D. C.  
DISTRIBUTORS IN PRINCIPAL CITIES



## THE GRINDER FOR AIRCRAFT'S PRECISION



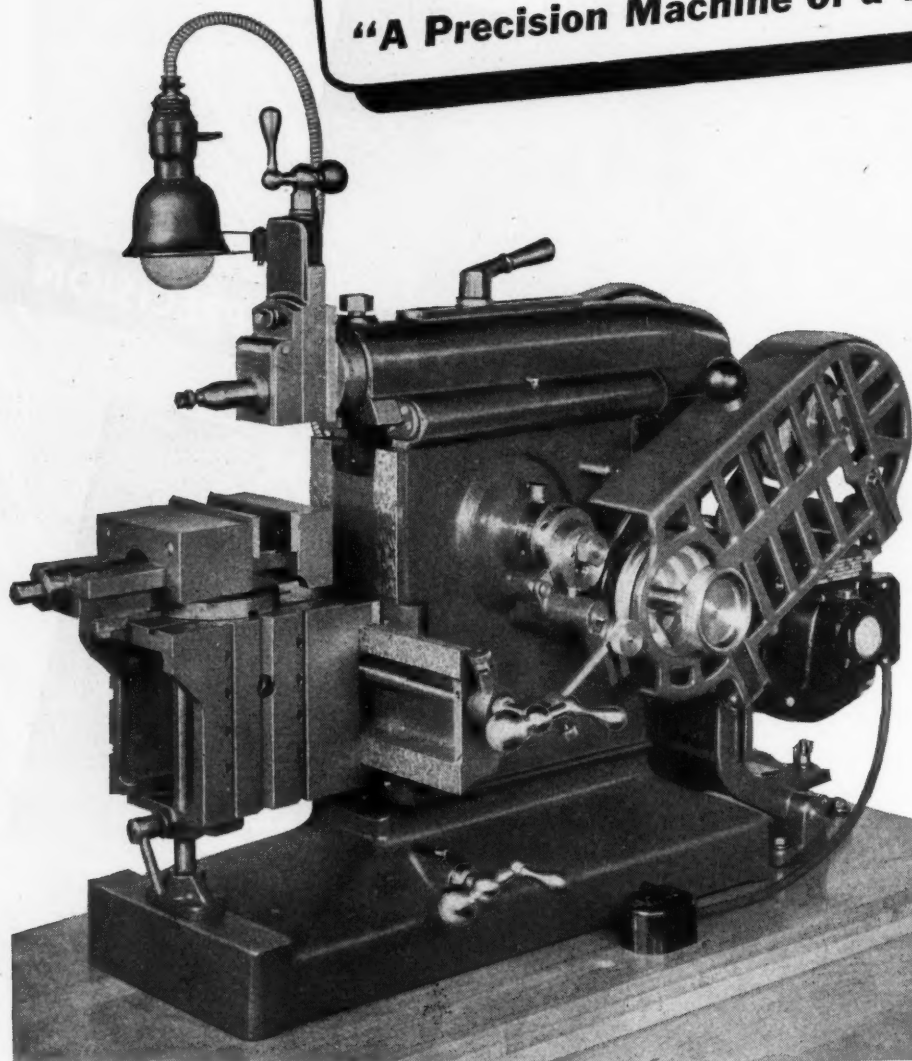
# Thompson

An example of the Thompson Grinder's efficiency for accurate aircraft production is illustrated above, showing in a close-up view how the tops and sides of steel Universal Yokes for control-parts are precision-ground on the Thompson No. 5 Hydraulic Surface Grinder at one of the Boeing Aircraft Company's plants. Wherever superior finishes are required . . . wherever close tolerances are specified . . . wherever production time is a factor of vital importance . . . there you'll find Thompson Grinders in action! Their "streamlined-designing" is a Thompson feature that pays dividends in the form of outstanding production records demanded by the Aircraft industries. Full details and illustrated Bulletins will be sent upon request to the Thompson Grinder Company, Springfield, Ohio.

# AMMCO

## 7" SHAPER

**"A Precision Machine of a Thousand Uses"**



A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

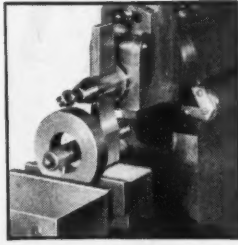
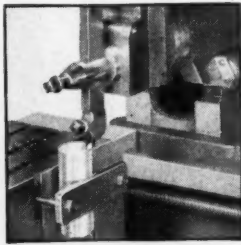
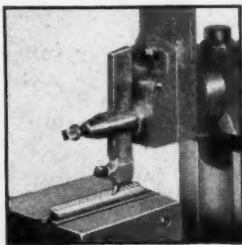
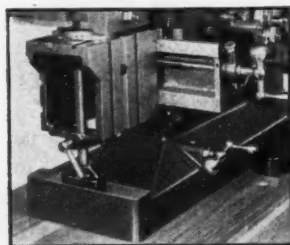
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit... Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job... Just plug in to an electrical outlet, and go to work. Saves steps and time.



**Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable**



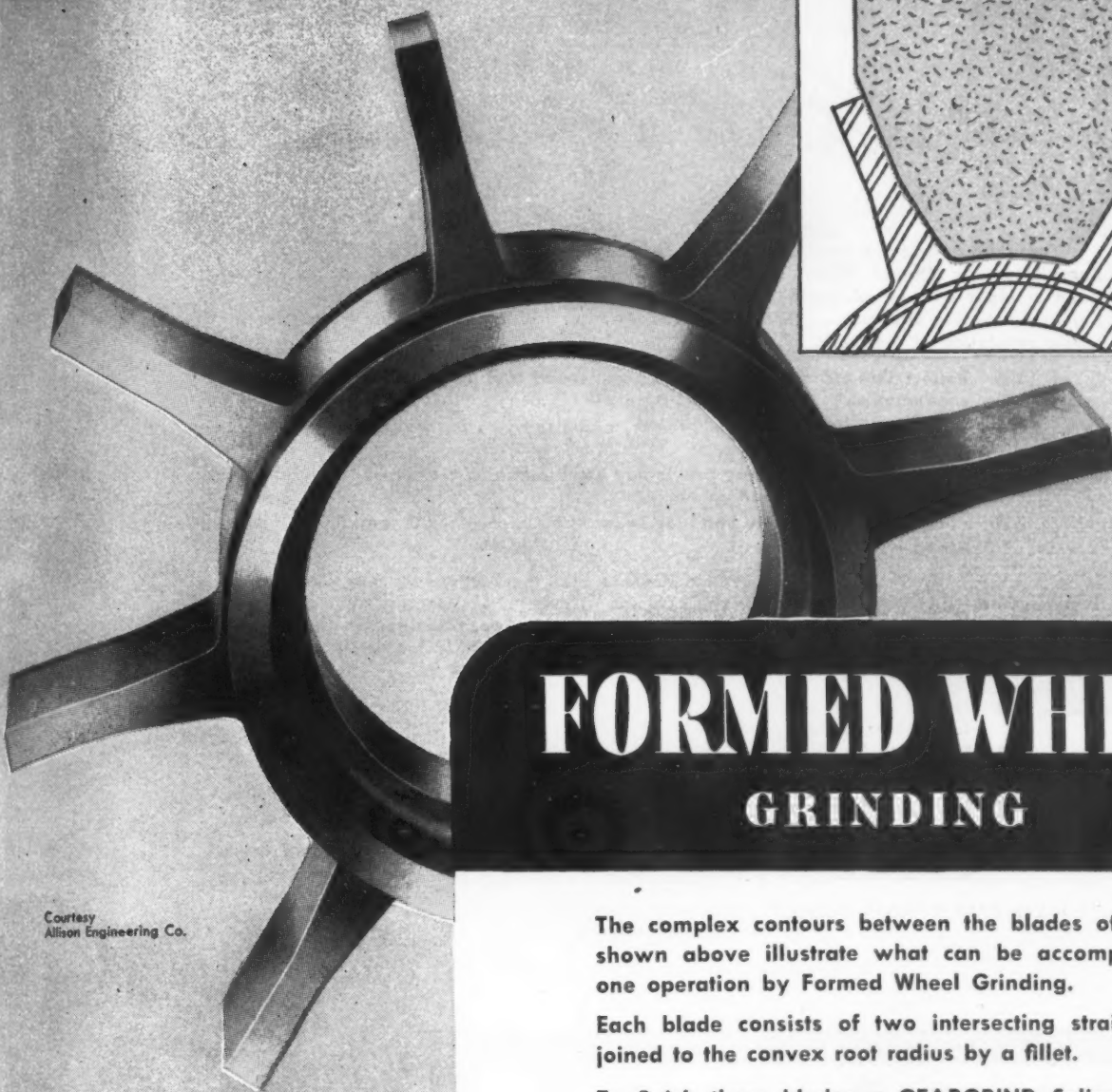
**Write today for specifications and prices**

# AMMCO

2100 COMMONWEALTH AVENUE  
NORTH CHICAGO, ILLINOIS







Courtesy  
Allison Engineering Co.

## FORMED WHEEL GRINDING

The complex contours between the blades of the part shown above illustrate what can be accomplished in one operation by Formed Wheel Grinding.

Each blade consists of two intersecting straight sides joined to the convex root radius by a fillet.

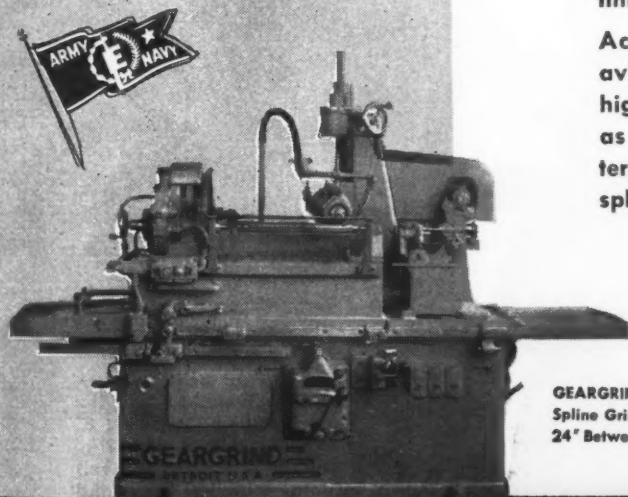
To finish these blades a GEARGRIND Spline Grinder, Type SG-11 is used. The grinding wheel is dressed to the required contour as illustrated above. One operation finishes both blades, root fillets and root diameter.

Accuracy is held within the limits required by America's aviation engineers. Finish is excellent. Production is high. Investigate GEARGRIND Machines for special jobs, as well as for their recognized function of producing external and internal gears, external and internal involute splines, straight splines, serrations and racks.

### CATALOG ON REQUEST

We are in position to design and build special machines for special jobs where Formed Wheel Grinding answers the need for production, accuracy and finish.

GEARGRIND Type SG-11  
Spline Grinding Machine  
24" Between Centers



The

MACHINE COMPANY

Manufacturers  
of the  
**RZEPPA**  
Constant Velocity  
Universal Joint.

# Speeding Our Forces

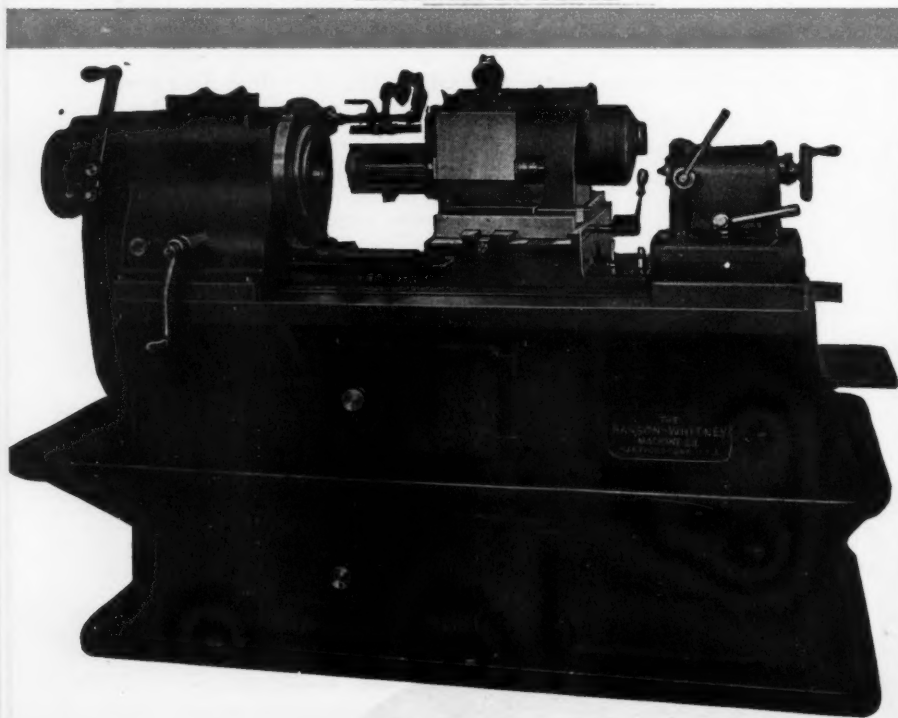
Throughout America production PLUS is being delivered around the clock with H-W Semi-Automatic Thread Millers which produce external or internal threads, right or left hand or taper with equal facility and precision. The H-W milling method offers the advantages of multiple cutters . . . threading of all lengths within the machine's capacity in a single revolution of the work.

- Perfect threads are produced at high speed and with a maximum operating convenience.
- Danger of spoiled work is greatly minimized . . . highest accuracy and precision are obtained.
- Permits working of many previously hard-to-thread materials . . . maintaining accuracy, precision and speed.
- Produces right or left hand or taper threads . . . with equal facility and precision.

Also H-W taps can be depended on to take the bottlenecks out of thread production . . . delivering longer runs between grinds . . . minimizing down time . . . reducing rejects . . . These advantages are made possible by the "Hanson Process" . . . our exclusive method of finishing after hardening . . . insuring uniform grain structure from tip to shank.

- H-W Taps are invariably correct in pitch and form and can be depended on for greater accuracy.
- Every H-W Tap is carefully inspected. Note the keen cutting edges and the perfection of the finish.
- Precise thread production . . . longer runs between grinds . . . speeded-up production . . . are insured by using H-W taps.
- There's a H-W tap for every tapping problem. Look for the "Hanson Process" emblem on the taps you buy.

If you have a thread milling or tapping problem write or wire. . . .



(Left) 8 x 16 inch Hanson-Whitney Semi-Automatic Thread Miller. Capacity: 8" diameter external with 2 1/2" cutter 8" diameter (max.) internal with 2 1/2" cutter and 1" diameter (minimum) with 7/16" cutter.

## The HANSON WHITNEY



*to Victory...*



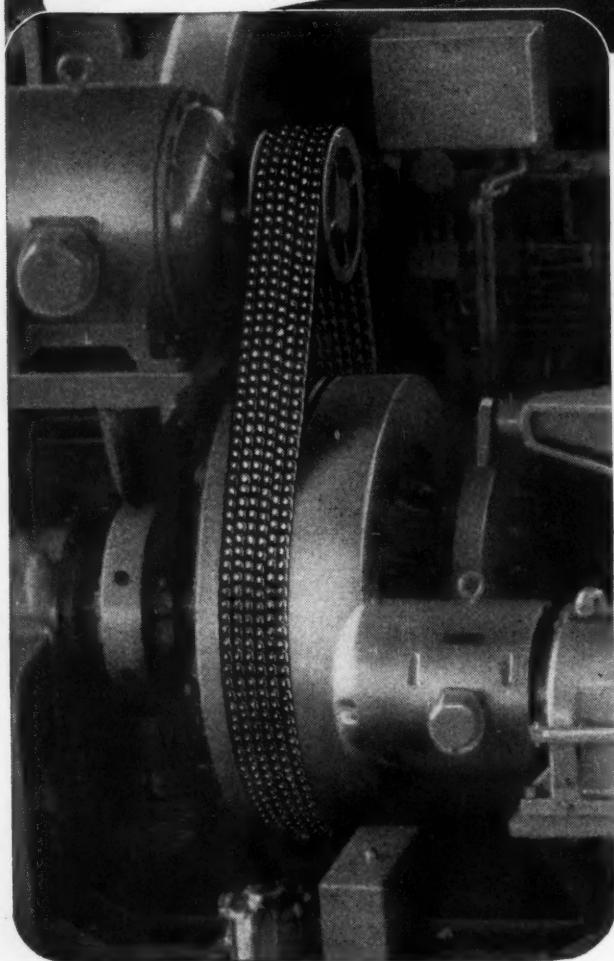
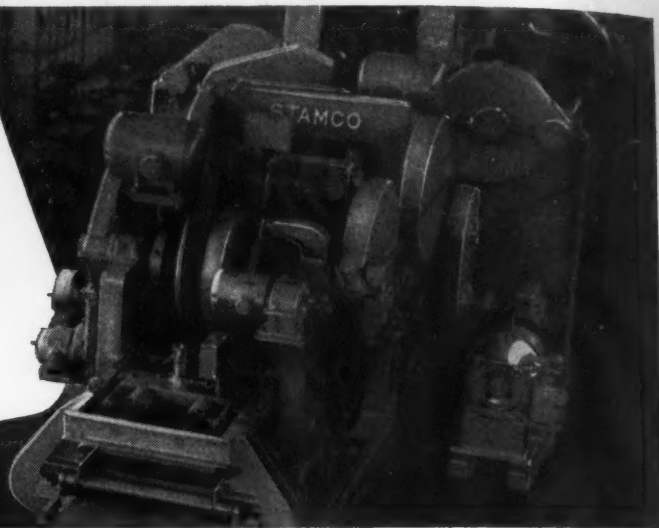
LOOK FOR THIS EMBLEM

**Y MACHINE CO., HARTFORD, CONN.**



24 HOURS A DAY . . . EVERY DAY FOR FIVE YEARS!

That's **CONTINUOUS**  
**OPERATION** with  
**VEELOS**  
THE ADJUSTABLE V-BELT



Six strand VeeLos V-belt on Stamco Automatic Resquaring Unit.

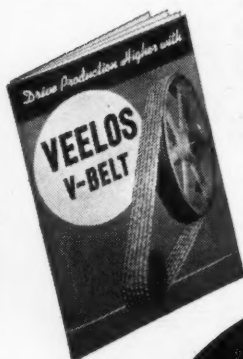
**H**ARD at work in a steel plant . . . 24 hours a day for 5 years . . . the VeeLos V-belts on a Stamco Automatic Resquaring Unit are still giving "very satisfactory service." Only shutdowns in that period have been for machine lubrication and changing blades on shears.

And that Stamco unit does a tough job . . . the resquaring of steel plates and sheets. The performance of this installation proves that VeeLos V-belts provide:

**1. Longer Belt Life.** Three VeeLos features combine to provide longer belt life: **A.** The reduction of bending stress by VeeLos' extremely flexible laminated link construction. **B.** Uniform distribution of the load on all strands through equalized tension. **C.** Perfect fit in the groove on all sheave diameters.

**2. Adjustability for Continuous Machine Production.** With VeeLos in rolls, V-belts can be adjusted or replaced in a few minutes or less . . . maintaining machine production . . . reducing machine downtime.

Belt drives that maintain continuous production over a long life are worth learning about. Write today for free 8-page illustrated manual giving VeeLos applications, construction detail, installation directions and engineering data.



MANHEIM MANUFACTURING & BELTING CO.  
MANHEIM, PENNSYLVANIA



LINK CONSTRUCTION UPS PRODUCTION

**VEELOS**  
THE LINK  
**V-BELT**

ADJUSTABLE TO ANY LENGTH  
ADAPTABLE TO ANY DRIVE

S!

FOR PRODUCTION—TOOL ROOM—MAINTENANCE

*..A Simple low-cost answer  
to metal sawing problems*



**WELLS No. 8**  
**Capacity**  
8" x 16" RECTANGLE  
8" DIAMETER, ROUND

**S**AVE TIME AND LABOR by placing a Wells Saw wherever you have metal to cut—production line, tool room, repair shop or other departments. The Wells is such a low cost, versatile saw, there is no need to tie-up large special production units on odd jobs—or to waste time and labor transporting metal to a saw (the Wells is easy to move to the job).

Why not see your supply man for complete details and a demonstration—it will be worthwhile.

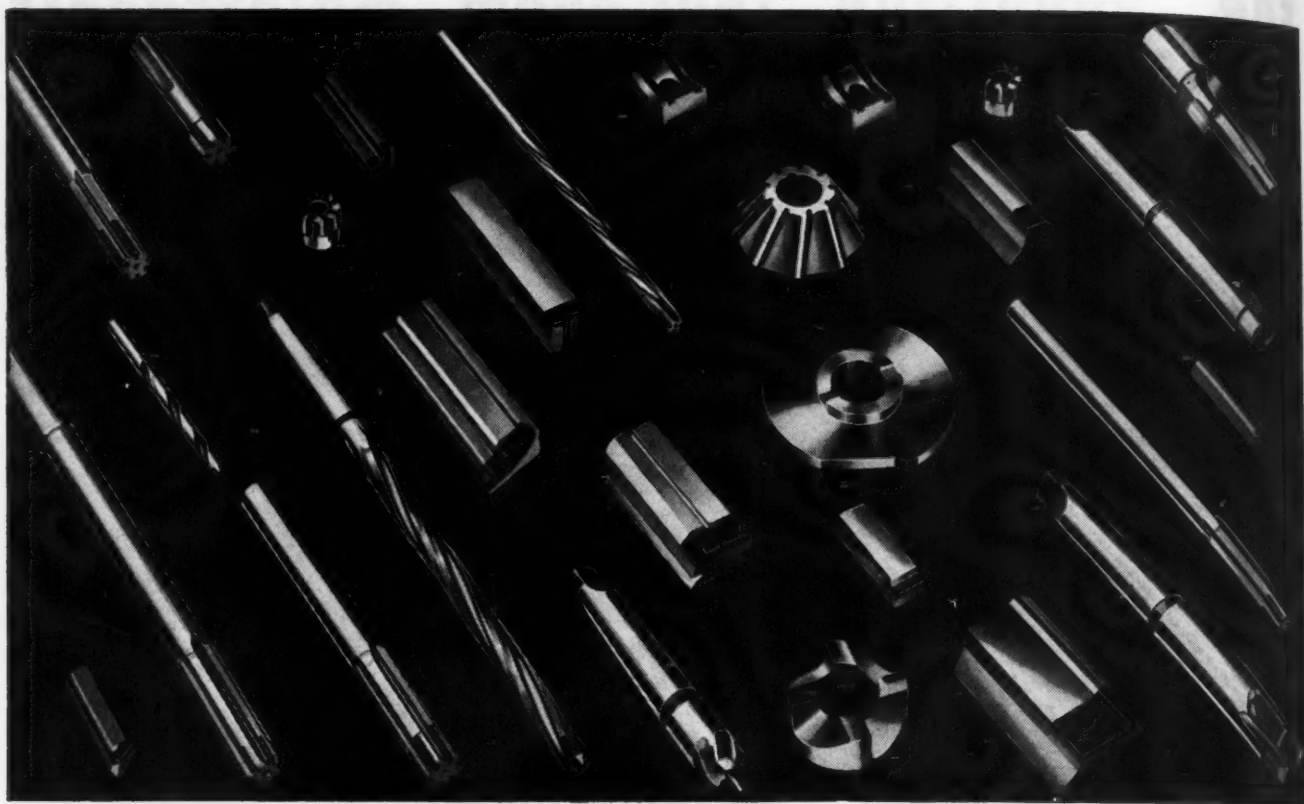
*Products by Wells are Practical*

**METAL CUTTING  
BAND SAWS**

WELLS MANUFACTURING CORPORATION  
404 SOUTH GRANT, THREE RIVERS, MICHIGAN

MACHINERY, August, 1944—301





**These Tools Are**

# *Super Specials!*



In addition to manufacturing all types of special carbide-tipped tools, Super Tool Company makes a complete line of Standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers.



**D**O you have any production jobs that require special cutting tools? If so, consult Super Tool Company. For Super Tool engineers have the engineering knowledge, the actual production experience and unexcelled plant and laboratory facilities to properly analyze your requirements and to design and build special carbide-tipped tools that will bring you maximum efficiency and money-saving economy.

Super Tool Company manufactures carbide-tipped tools exclusively—and has done so for many years. These years of experience, research, development and improvement are your assurance of complete satisfaction when you use carbide-tipped tools bearing the Super Tool Company name.

Whether your cutting job requires special or standard tools, whether you are cutting cast iron, steel or non-ferrous material, if you want speedy production, long tool life, extreme accuracy, fine finishes and real economy, try Super Carbide-Tipped Tools. You, too, will say they're "SUPER!"

## **SUPER TOOL COMPANY**

*Carbide Tipped Tools*

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.



# Consider These **9 ADVANTAGES** of the Sunnen Precision Honing Machine *for INTERNAL FINISHING*

- 1** Honed and finishes internal cylindrical surfaces from .185" to 2.625"
- 2** Accuracy is guaranteed within .0001"
- 3** Produces a super-smooth finish
- 4** Used in ferrous or non-ferrous metals, plastics, ceramics, glass, etc.
- 5** Accurately duplicates sizes
- 6** Does not require skilled labor
- 7** Can be "set-up" for any size in one minute
- 8** No jigs or fixtures needed
- 9** Economical to operate

**S**ome recent refinements add to the accuracy and efficiency of the Sunnen Precision Honing Machine. A new base and coolant pump has been added that provides a constant flow of honing fluid to the work. A machine light makes inspecting and gaging parts easier.

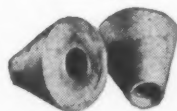
Yet, with all these advantages, the Sunnen Precision Honing Machine is low in cost. Let a Sunnen engineer give you complete information — or write for free catalog.



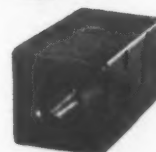
The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.



*Typical Jobs*



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



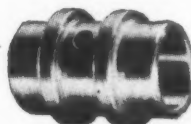
Saved time in producing a smooth, accurate finish on this bronze remote control valve body.



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



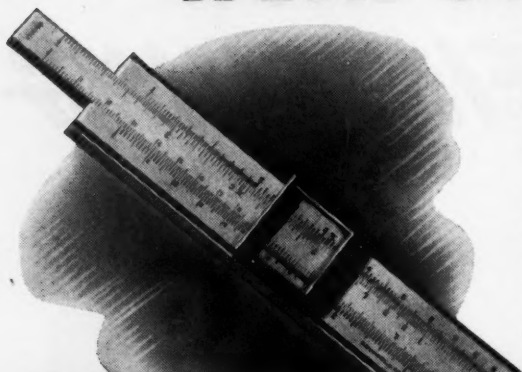
Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

**SUNNEN**

**SUNNEN PRODUCTS COMPANY • 7940 Manchester Avenue, St. Louis 17, Missouri**

Canadian Factory: Chatham, Ontario

# WEAPONS OF *P*EACE!

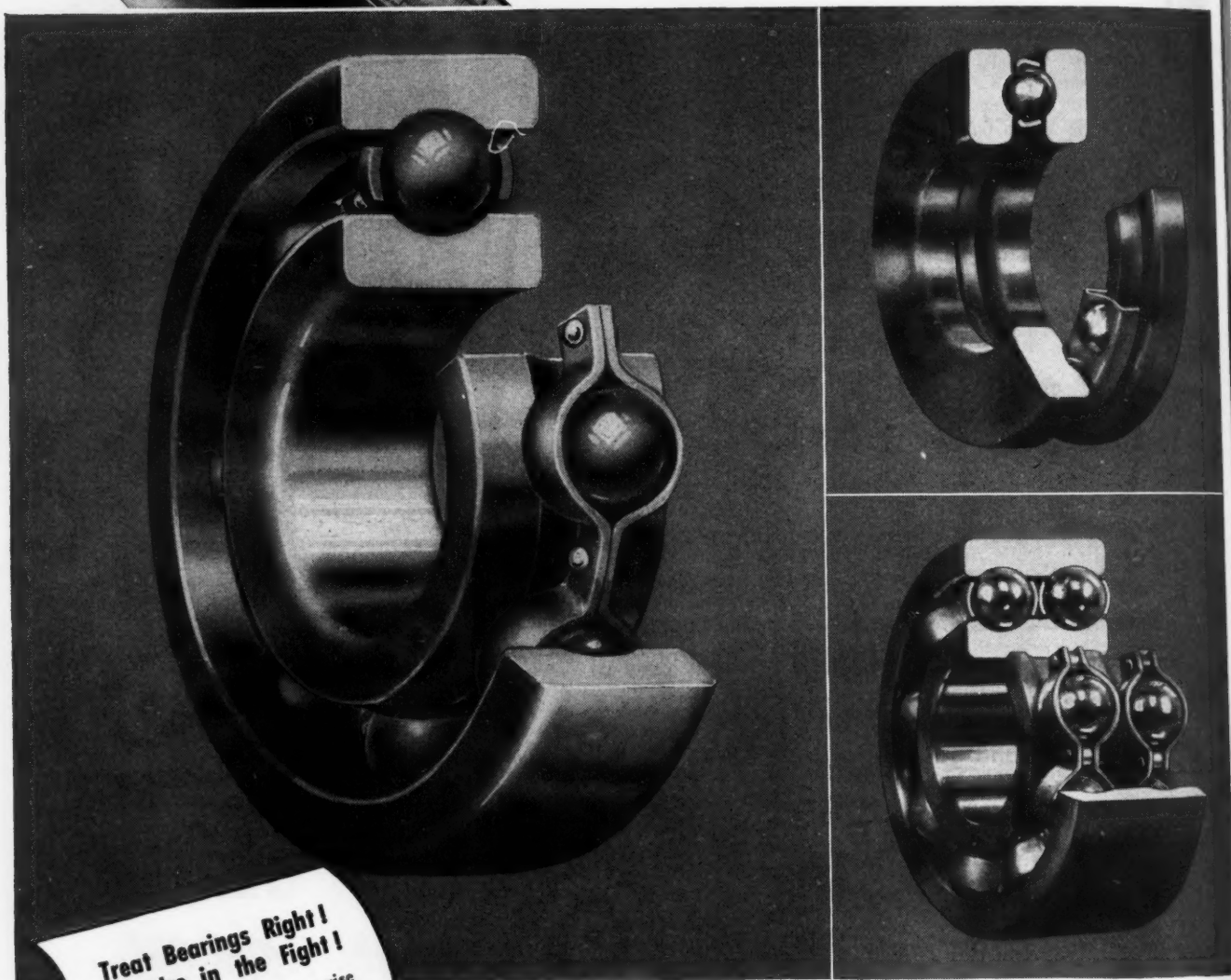


ORDNANCE OFFICERS will tell you that ball bearings are weapons of war. Cut off a nation's supply of ball bearings, they'll say, and you deprive it of military mobility.

BCA Ball Bearings will also be weapons of *peace*... weapons of the designers and engineers who will spearhead the fight for wider acceptance of American machines... tools... cars... trucks... tractors.

The time to consider how BCA Ball Bearings may help *you* in that fight is *now*. Plan your use of BCA's *before* the reconversion. It's one step that will help you avoid the risks of production and sales lag.

BEARINGS COMPANY OF AMERICA, LANCASTER, PENNA.



**Treat Bearings Right!  
They're in the Fight!**

1. If shaft is placed in a vise when mounting bearings, protect the shaft with soft metal, wood, cardboard or paper.
2. Be sure housing covers are tight. They are designed to keep lubricant in... keep dirt out. They can't do either if they're loose.
3. Store bearings in a dry place.



RADIAL • ANGULAR CONTACT • THRUST  
**BALL BEARINGS**

# READY TO TACKLE YOUR PROBLEMS with OIL HYDRAULICS

You'll find the evidence all about you—oil hydraulics is moving rapidly into almost every phase of the industrial picture. It is setting a fast pace for new and improved ways of getting things done *better*. If you haven't already had occasion to note this trend, or to take advantage of it in your wartime production, your postwar planning will bring it sharply into focus.

The *reason why* hydraulic power is so much better for so many jobs is simple enough: oil under pressure can be applied to almost any power need to give *stepless* speed variation; *constant* speed control; shockproof starting, stopping and reversing; *direct* and *instant* control of power or movement; *uniform* power in any direction, in rotation, or in operating sequences; many other similar advantages.

Knowing *how* to apply oil under pressure to achieve the right combination of advantages for each job is not quite as simple. But Denison HydrOILic Engineers have solved so many new problems in this field—for so many different industries and over so many years—that they have reduced this important "know-how" to an almost exact science.

In making these technical advances, Denison has proved the advantage of *complete oil hydraulic service*, from expert analysis of individual requirements to installation and initial operation of the HydrOILic equipment that meets them.

You are invited to avail yourself of this specialized experience. No matter how vague or how concrete your immediate and postwar planning may be, now is the time to begin discussing HydrOILics in terms of your particular needs. Write today.

The DENISON Engineering Co.  
1152 Dublin Rd., Columbus 16, Ohio

## ANALYZING the PROBLEM



## DESIGNING the ANSWER



## BUILDING the EQUIPMENT



## INSTALLING the EQUIPMENT



HUNDREDS of production jobs and special operations are handled with HydrOILic Equipment—in wartime and peacetime industry alike. Among these tasks are assembling, straightening, broaching, conveying, extruding, crimping, loading, lifting, handling, hauling, hoisting, tilting, testing, turning, pushing, pulling, packing, pressing, indexing, rotating. Let Denison Engineers help you determine how, and HOW MUCH, HydrOILics can help you.

Industry's Right Hand



**DENISON**  
EQUIPMENT in APPLIED  
*Hydr ics*





# PROTECTION FOR OPEN AND ENCLOSED GEARS

The periodical check-up with a feeler gauge tells the story.

With LUBRIPLATE Lubricants, the teeth of gears are absolutely separated by a load carrying film. Metal cannot touch metal. LUBRIPLATE lowers operating temperatures and seals the gears against rust and corrosion. Yet, in spite of its protective qualities, LUBRIPLATE does not cause drag. Even the most delicate, high speed gears operate better with it. LUBRIPLATE reduces friction to a minimum.

Yes, open and enclosed gears as well as chains, slides, sleeve and anti-friction bearings and all contacting parts last longer and require less power to drive them when lubricated with LUBRIPLATE. Let us send you a copy of "The LUBRIPLATE Film" that tells the whole story. It is written especially for your industry.

## LUBRIPLATE DIVISION

FISKE BROTHERS REFINING COMPANY

NEWARK, N. J.

SINCE 1870

TOLEDO, O.

WRITE FOR THE NAME OF THE DEALER NEAR YOU

### *R* FOR YOUR MACHINERY

**No. 3**—Ideal for general oil type lubrication. Ring oiled bearings, wick feeds, sight feeds and bottle oilers.

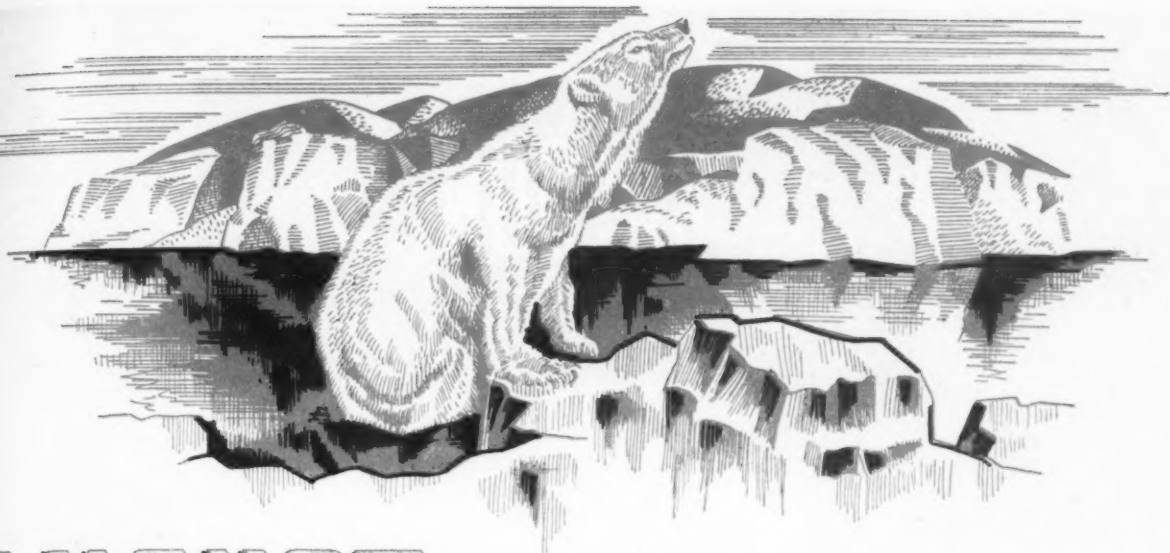
**No. 8**—Because of its high film strength and long life reflects outstanding performance in most types of enclosed gears (speed reducers).

**No. 107**—One of the most popular grease type products for general application by pressure gun or cups.

**No. 70**—For a wide range of grease applications, especially at temperatures above 200 degrees F.

**No. 130-AA**—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

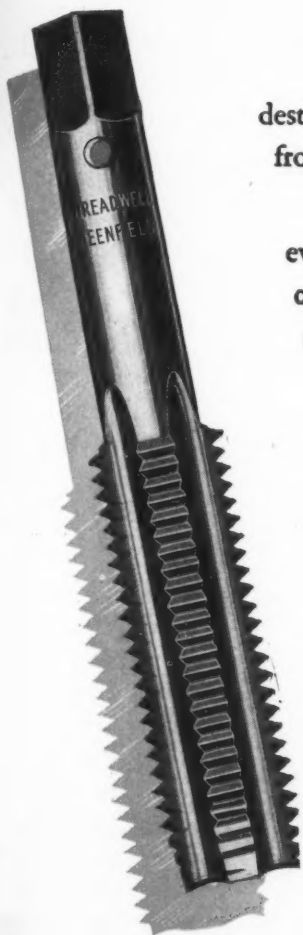
**BALL BEARING**—This is the LUBRIPLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.



# AUGUST

is a good time to present

## THREADWELL COLD-TEMPER TAPS



Threadwell *Cold-Temper* Taps scientifically cold treated at 120° below zero are destined to revise your ideas of tap performance and longevity, however solidly frozen you may have considered the accepted standards.

Threadwell *Cold-Temper* Taps are harder, more resistant to wear than you ever dreamed a tap could be; at the same time they are actually *less brittle* than ordinary taps. They are particularly suited for the tapping of plastics and other abrasive materials.

Now is the time to get the *cold* facts on this *red hot* development. Ask your Threadwell Tap Distributor or let us tell you the story—ice-packed with production significance for you—of Threadwell *Cold-Temper* Taps.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA

EXPORT STOCKING DISTRIBUTORS:

CANADA, Bridge Machinery Co., Montreal; ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc. THROUGHOUT THE WORLD



# THREADWELL

TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

Contact **KAYDON** of Muskegon  
*For Unusually Large, High Precision Bearings*

**BALL and ROLLER BEARINGS**

*Standard and Special*

FROM 6" INSIDE DIAMETER TO 100" OUTSIDE DIAMETER  
COMMERCIAL FINISH OR ULTRA-PRECISION

**Spherical Roller Bearings**  
**Radial Ball Bearings • Thrust Ball Bearings**  
**Radial Roller Bearings • Thrust Roller Bearings**  
**Taper Roller Bearings**

*Straight or Self-aligning • Extra Heavy Duty or Special Light Type*

LIGHT WEIGHT NON-METALLIC CAGES OR STANDARD BRONZE TYPE

★ *Early Delivery* ★

---

**PRECISION MACHINE WORK OR GRINDING**

*to unusual accuracy in large diameters*

ATMOSPHERE HARDENING • FLAME HARDENING • PRECISION HEAT TREATING  
METALLURGICAL LABORATORY • MICROSCOPY AND PHYSICAL TESTING



**THE KAYDON ENGINEERING CORP.**  
**MCCRACKEN STREET • MUSKEGON, MICH.**

For excellence in production of extremely precise,  
unusually large ball and roller bearings

*New in Name... Old in Experience*






**Save Time!**

**OLSEN  
PRODUCTION  
BRINELL**

**AUTOMATIC-DIRECT READING**

Write today for Bulletin #1 which describes in detail the full line of Olsen Brinell Hardness Testers—Standard—Automatic—Portable—Special.



Proving every day that the value of testing depends on the quality of the testing equipment.

# AMERICAN *Phillips* SCREWS

## Prevent Disastrous Slips

... in assembling planes



Firm, 4-point engagement of the American Phillips Driver with the recessed American Phillips Screw is positive prevention of the driver slipping out, and ripping up the plane's "skin" . . . on which not a scratch is permissible.

American Phillips Screw and Driver align themselves automatically into a single unit that can't drive any way but straight. That's why American Phillips Screws are so easy to handle, so quick to drive, so untiring even to women workers.

*And that's why, in all applications from airplane manufacturing to bone surgery, the total time they save often adds up to 50%.*

... in setting fractured bones



Just as American Phillips Screws protect against slashes on an airplane's skin, so they protect fracture-patients against wounds caused by the driver slipping out of slotted-head screws.

A western surgeon writes: "We have had a Vitallium metal driver and screws cast on this (Phillips) principle, and have been highly gratified by their use. Time of driving is much less. Driver never slips and jabs the patient. Actual asepsis (freedom from germs) is better because the surgeon is not tempted to use his free hand to steady the driver".

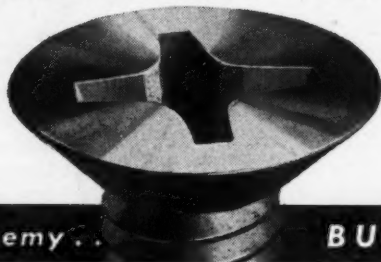
No matter what *your* fastening problem, you will profit equally by using American Phillips Screws.



## AMERICAN SCREW COMPANY

PROVIDENCE 1,  
RHODE ISLAND

CHICAGO 11: 589 E. Illinois Street  
DETROIT 2: 502 Stephenson Building



Put the screws on the enemy.

BUY WAR BONDS!

*a* **HINT**

... Mr. Manufacturer

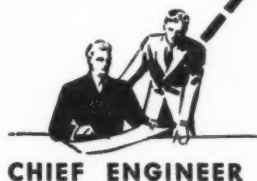
**PRESIDENT**

**VICE PRESIDENT**

**PURCHASING AGENT**

**SCULLY  
-JONES**  
TOOL  
ENGINEERING  
MANUAL  
**500**

## GIVE YOUR STAFF A BREAK



**CHIEF ENGINEER**



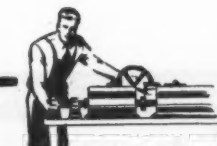
**DESIGNER**



**DRAFTSMAN**



**SHOP SUPERINTENDENT**



**TOOL ROOM**

Your different department heads need the help you can give them by passing along your copy of the Scully-Jones Tool Engineering Manual 500. The tooling data and information in this book will save them long hours of searching. Requests from the men in the shop plus the paper shortage has made it impossible for us to supply your entire staff with books, so we ask for your help. Pass your copy on to the shop, notify us and we'll replace it when victory is won.

**Scully-Jones**  
AND COMPANY  
1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.



Outside of a bearing . . .  
just a speck of dirt!

# DAM THE DIRT!



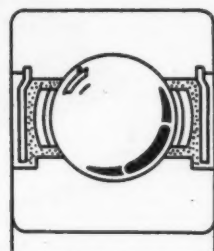
Inside of a bearing . . .  
a destructive abrasive!

Dirt is the curse of every user of motors and machines. In shop and factory it gets into the average bearing, where it destroys the high finish, abrades the polished surfaces, creates friction that results in vibration, looseness and noise. And its action is cumulative—once started, it leads to premature bearing failure.

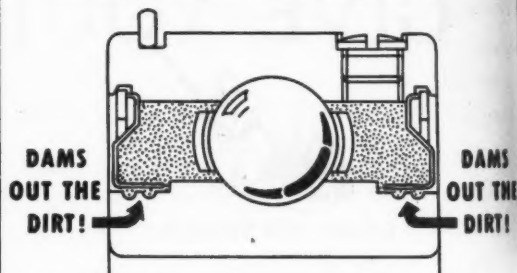
In the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING, wearless metal seals combine with "labyrinth" grease grooves to form a highly effective barrier that dams out dirt—at the same time preventing the escape of the lubricant packed in the extra large grease reservoir afforded by the double-row width of the bearing. As a result, the initial high anti-friction efficiency of the "CARTRIDGE" BEARING is maintained over extremely long periods.

*NOTE:—Many representative motor, machine and tool builders are incorporating the "CARTRIDGE" BEARING in their products. When you buy such units, ask for the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING.*

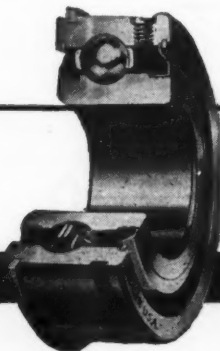
## **NORMA-HOFFMANN** **"CARTRIDGE"** **BALL BEARING**



This shows a section of an ordinary single-row "shielded" ball bearing, with its space restrictions limiting the grease capacity and the effectiveness of the sealing devices.



Here, in contrast, note how the "CARTRIDGE" BEARING double-row width not only affords at least 100% larger grease capacity than the ordinary single-row "shielded" bearing, but also permits the use of a highly effective and wearless seal.

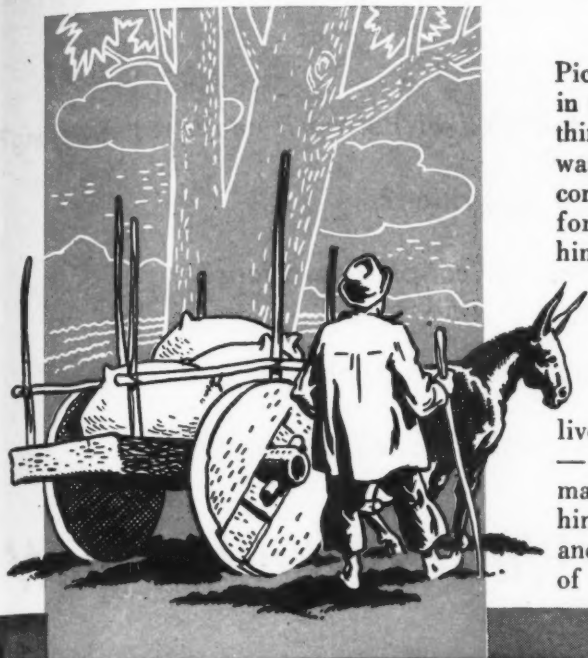


**NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN.**

**FOUNDED 1911**

TO WIN THE WAR: WORK—FIGHT—BUY WAR SAVINGS BONDS!

# what has this to do with broaching?



THAT depends upon how you look at it. Pictured here is a crude, two wheeled cart, still used in transportation. The wheel is a pretty commonplace thing these days — yet the wheel, as time has proved, was one of the most revolutionary inventions for the comfort and convenience of Man. In its rudimentary form it took heavy loads from Man's back and gave him greater mobility. As a means for utilizing the tremendous energy of falling water, the water wheel harnessed nature to turn other wheels — to grind corn and to power the earlier machines which in turn allowed Man to work *less* . . . and produce *more*. Almost unrecognized it exerted a profound influence on our lives and habits. In modern streamlined transportation — railroad, automobile, airplane — the wheel enables man to have far greater pleasure in the world about him, vacationing and visiting with friends both near and far. Actually, civilization has sprung from the ruts of countless wheels.



So, too, with Broaching . . . from a primordial type of drilling to present day precision production, Broaching's principles have been amplified until they now cover the entire metal-working field. Just as the use of the wheel expanded from the crude vehicle stage to its present use in diverse sizes and shapes . . . in intricate machinery making countless tools, machines, and vehicles for Man's even greater comfort and convenience . . . just so will Broaching become an increasingly powerful influence in making machines to turn out more and better and cheaper products to lessen Man's work and increase the joy of living.

Earliest historical references to Broaching mention use of a toothed tool to form tap holes in wine barrels.



## LAPOINTE

## Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

# MISTER, if these are *YOUR* questions—

How many pieces will cut-off tool deliver before it needs resharpener?

What is cost of each cutting-off operation?

What is cost of preparing blade for cut-off operations?

(to make a new blade or alter another one in your own shop)

What is cost of replacing setup after resharpener?

Can resetting be done by anyone but skilled operator?

Then **HERE** is the cut-off blade to know about!



**TODAY, ACCEPTED IN LEADING  
PLANTS FOR ITS REMARKABLE  
PERFORMANCE—ECONOMIES,  
SPEED AND QUALITY PRODUCTION.**

**READY TO USE! PROVIDED WITH ACCURATE MACHINE GROUND CLEARANCES  
WHICH ELIMINATE EXCESSIVE FRICTION—SPEED PRODUCTION—  
SIMPLIFY OPERATIONS—REDUCE BREAKDOWNS AND DOWNTIME**

Why be bothered making a cut-off tool today when one can be supplied to you ready to be put on your machine? Once set for specific job it requires very little attention during operations. Your skilled operators can thus be relieved to do more essential tasks. Even when resharpener is required the blade can be removed from holder and replaced with precision accuracy without necessitating skilled hands. The scientific T-shape design

causes all excessive friction to be eliminated; thereby extending blade life, increasing production, reducing breakdowns, achieving higher quality results.

This remarkable blade is Empire Tool Company's Luers Patented Cutting-off Blade. It is available both parallel and tapered on longitudinal cutting width. And just recently the same features were offered in a Cobalt Blade designed for the real tough jobs.

*Also manufacturers of Empire Floating Tool Holders and distributors of Fastcut Centerdrills and Keyseat Cutters*

**Send for Catalog**

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

**BUY WAR BONDS**

**The Blades That  
Reduce Friction**

**EMPIRE Tool Co.**

**8786 Grinnell Ave.  
Detroit 13, Mich.**



# ARMSTRONG

## They still don't know the capacity of an ARMSTRONG TOOL HOLDER



War urgency has led to a phenomenal stepping-up of speeds and feeds on lathes, planers, slotters and shapers. Some operations are now being done on the same equipment in half or even less the time which was thought to be "required" in prewar days. Still in no case have they reached the ultimate capacity of their ARMSTRONG TOOL HOLDERS.

So designed that the machine with greatest efficiency, with greatest convenience, maximum clearance, maximum visibility . . . with simple, inexpensive cutter bits any mechanic can quickly grind from stock shapes of high speed steel, ARMSTRONG TOOL HOLDERS still have strength beyond any need, have capacity beyond that of the machine tools on which they are used.

For more production per man and more pieces per machine, tool completely with ARMSTRONG TOOL HOLDERS. Keep up with war time requirements; be equal to the speeded-up post-war competition.



### ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

313 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse and Sales Offices:  
199 Lafayette St., New York 12, N. Y.



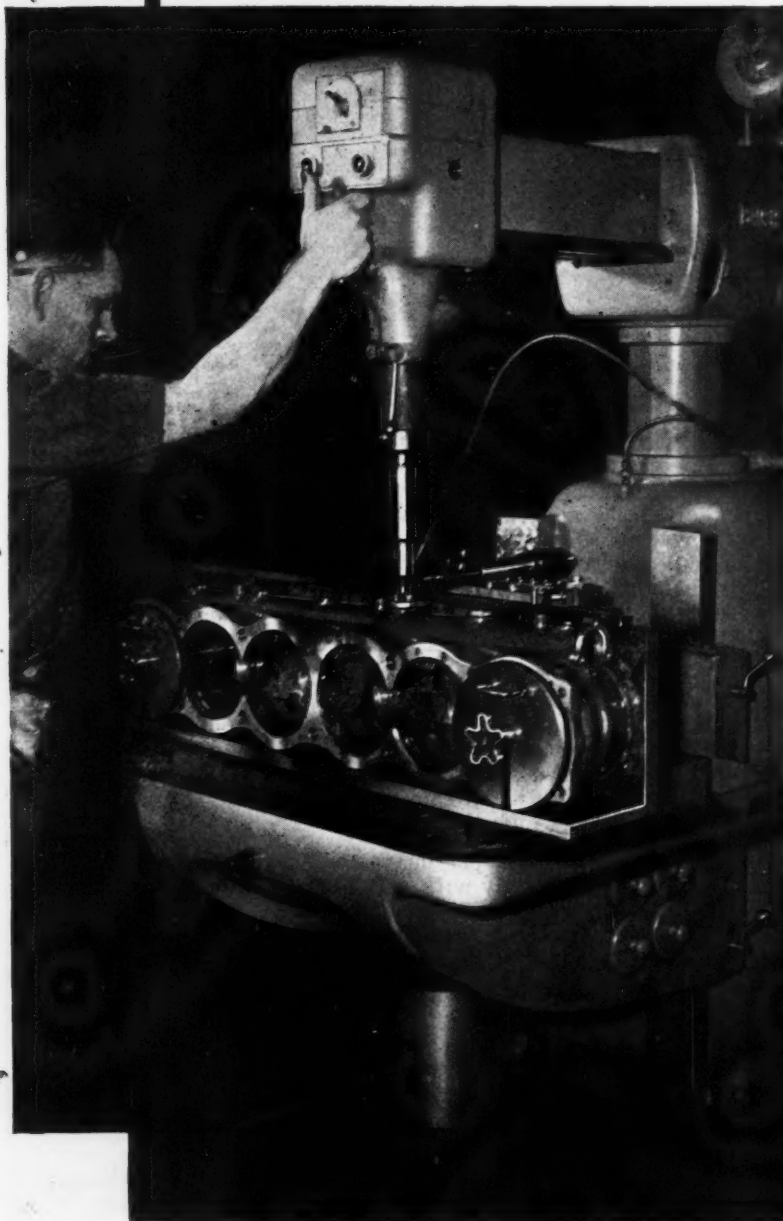
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

# BAUSH 50 YEARS OF PROGRESS

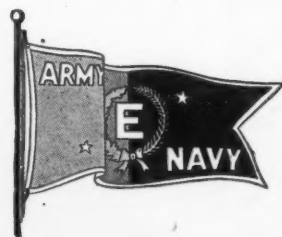
## speeds Aircraft Production today!

The Baush Machine illustrated below is helping step up production of urgently needed units in a well-known Aircraft Engine plant in the Midwest. Its productivity, speed and accuracy are the cumulative results of Baush's half-century of specialization in

the design and construction of single- and multiple-spindle machines for Drilling, Boring, Tapping and Reaming. An uninterrupted series of engineering advancements during these fifty years assures maximum efficiency, precision and speed on every job put on a Baush machine. For better war production today, for economical operation in the years ahead — look to Baush.



**LEFT:** A Baush Precision Tapping Machine set up for tapping coolant plug holes in the cylinder jacket of an Aircraft Engine. Radial arm enables tap to be quickly positioned over various holes in cylinder jacket, six such holes being tapped in one side of the casting without any readjustment of the work, and the same procedure repeated on the opposite side. Note extra heavy base, sturdy column, conveniently placed controls. Baush is ready to serve you in your problems of single- and multiple-spindle Drilling, Boring, Tapping and Reaming.

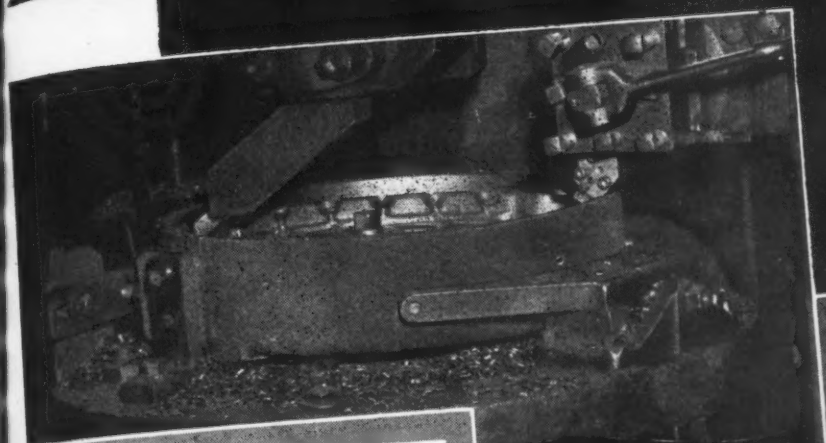


# BAUSH

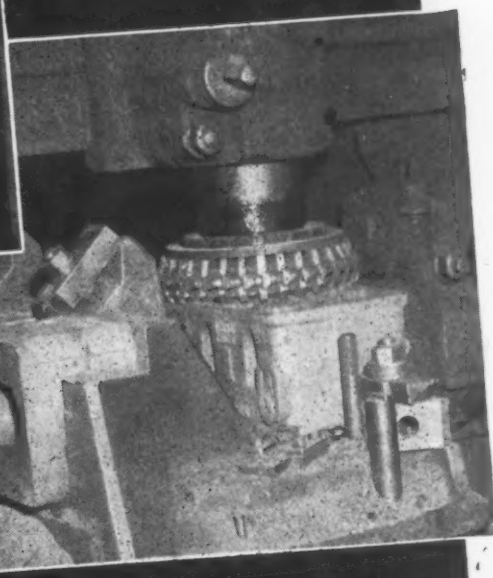
# LATROBE

## RED ARROW 101

for  
METAL CUTTING  
TOOLS



BORING and FACING



MILLING

### What users say!\*

#### SUPERIORITY

"Grooving brass shells at 860 S.F.M. We get 10,000 to 11,000 pieces per grind compared with 6,600 pieces per grind with former tools."

#### LONGER TOOL LIFE

"Your Red Arrow 101 has been running 40 hours between grinds at 400 S.F.M. on grey iron. Our operators like it better because cutting edges do not break down and that means more production faster."

#### TOUGHNESS

"We are machining steel rings which are welded and steel castings with intermittent cuts. We plan to use Red Arrow 101 on all our tough jobs."

#### LESS TOOL GRINDING

"We find Red Arrow 101 very satisfactory. It runs double the production of other tools we have used on our boring jobs."

#### HIGHER SPEEDS

"Red Arrow 101 tool bits enable us to increase the surface speed 100% with four times the tool life."

\*Selected at  
random from  
field reports.

Latrobe RED ARROW 101—the Cobalt-Chromium-Tungsten alloy that can be cast into many types of metal cutting tools—is furnished in the "as cast" state ready for grinding to finished tool dimensions. Improved casting technique enables us to produce castings of such uniform structure that "notching" of the gate end of Tool Bits is unnecessary. Standard Tool Bits are carried in warehouse stocks.

Latrobe RED ARROW 101 requires no heat treatment; is easily brazed to tool shank or body; will operate at greatly increased speeds and effect valuable savings in production time.

Ask our service department to help you with any problem concerning the use of Latrobe RED ARROW 101—either applications, speeds, grinding, brazing or any other detail.

Write for  
this Bulletin



*Latrobe* ELECTRIC STEEL COMPANY

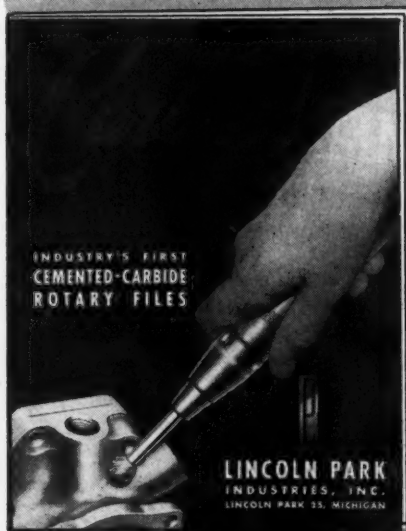
MAIN OFFICES and PLANT • LATROBE • PENNSYLVANIA

MACHINERY, August, 1944—317



# Now

# Carburs—INDUSTRY'S FIRST CEMENTED CARBIDE ROTARY FILES . . .



Carburs are now available in twelve standard shapes, each in from four to six different sizes and from fine to coarse cut—to meet almost any need. This new booklet contains illustrations and prices of all the standard tools now being produced. Write for your copy today.



Carburs have been put to almost every conceivable test and from the results of these tests conducted in actual production it has been proved that Carburs offer at least fifty times the tool life of high speed rotary files. They provide a sharp cutting edge over a long period of time . . . reduce burring, filing or cutting time per part materially . . . and generally increase efficiency in these operations in all types of production.



## LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1723 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

# 4 SPEEDS... 10 FEEDS Automatically Changed to Perform 23 Operations on this Aircraft Part

Two Foster Fastermatics operated by an inexperienced operator perform 23 operations in 2 chuckings on an airplane motor housing part made from steel forgings. These 23 operations include turning, facing, counterboring, chamfering, drilling and boring. A completed part is produced every 6 minutes which includes 2 loadings and 2 unloadings of the finished part. Floor-to-floor time for the first chucking is 6 minutes and for the second chucking is 5 3/4 minutes.

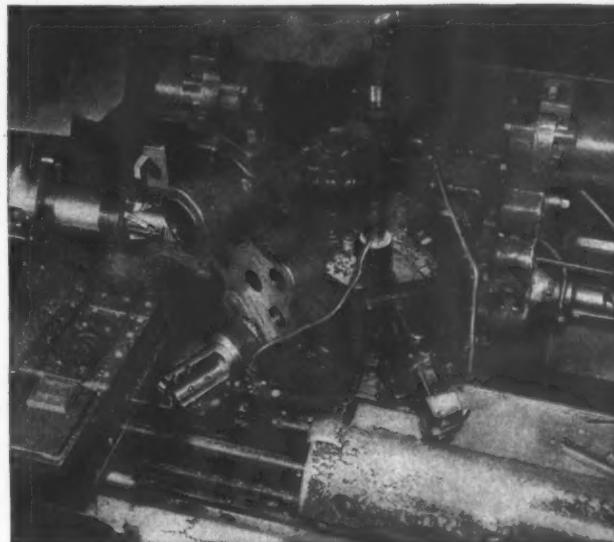
This production is a result of the automatic cycling of the machine which permits the operator to load and unload the second machine while the first machine is in production. The automatic speed control and hydraulic feed system of Foster Fastermatics permit tooling arrangements to insure the maximum operating efficiency. During the 23 operations on this part, 4 speeds of 51, 91, 148 and 263 r.p.m., and 10 feeds of .005" to .0118" per revolution automatically controlled for each operation are used.

Because each tool functions at its maximum efficiency as a result of the use of the proper feeds and speeds, the greatest tool life is obtained. Average tool life on this job was 46 hours using high-speed tools with the exception of the finish turning operation where cemented carbide tools were used.

It was interesting to note that on this job these machines have been in continuous operation for over 3 years without interruption for any mechanical reason. This clearly indicates the stamina of the hydraulically actuated turret lathe. This job is also another example of how the automatic cycling features of the Fastermatic permit the use of inexperienced operators and still maintains maximum production. The operator running these 2 machines was formerly a sweeper with no former machine operation experience.



View showing tooling set-up for first chucking. Operations include rough turning flange, rough facing both sides of flange, drilling, rough counterboring, facing boss, chamfering flange I.D. and O.D., finish counterboring, semi-finish turning flange, finish face both sides of flange, boring hole, and finish turning flange.



View showing tooling set-up for second chucking.

## JOB FACTS

**Machine**—Two 2F Fastermatic Turret Lathes.

**Part**—Motor Housing (Airplane Propeller).

**Material**—S.A.E. 1020 Steel Forging, Annealed (Dead Soft).

**Floor-To-Floor Time**—

1st Chucking—6 min.  
2nd Chucking—5 3/4 min.  
Finish to permit subsequent finishing operations.

**Speeds and Feeds**—

**1st Chucking**

1st Position—148—.0118"  
2nd Position—148—.0098"  
3rd Position—91—.0075"  
4th Position—148—.0063"  
5th Position—148—.008"  
6th Position—263—.005"

**2nd Chucking**

1st Position—This position skipped  
2nd Position—This position skipped  
3rd Position—148—.0066"  
4th Position—148—.006"  
5th Position—148—.0078"  
6th Position—51—.0079"



(Left) Parts before and after machining of first chucking.

**FREE!**  
Production Men Get  
the Facts in New  
"Fastermatic" Catalog

Get the complete facts and details of these highly productive, Foster Automatic Turret Lathes in the new "Fastermatic" catalog. Write to Foster Division, 1102 Beardsley Avenue, Elkhart, Indiana, for your free copy.

## INTERNATIONAL MACHINE TOOLS

*Foster Division - Elkhart, Indiana*

INTERNATIONAL DETROLA CORPORATION

DETROIT, MICHIGAN

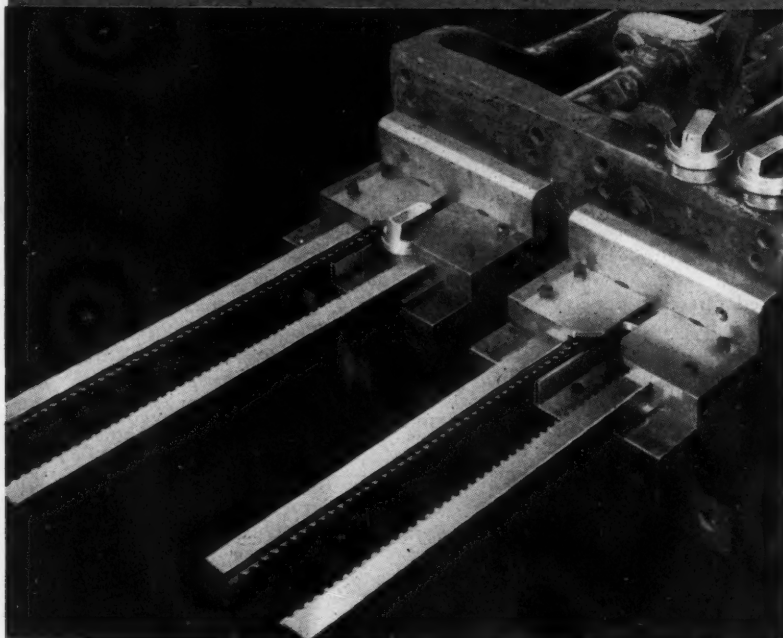
ELKHART, INDIANA

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OSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOLS

# Use Broaching

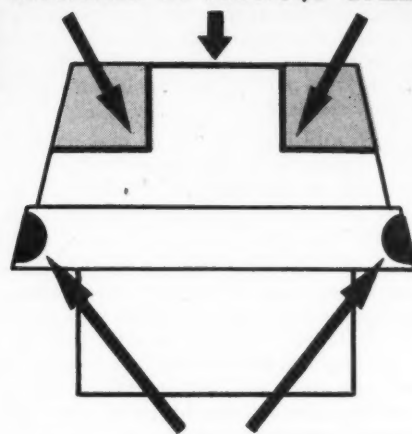
## FOR SIMPLE JOBS, TOO



**PRODUCTION IS HIGH  
YET TOOLING COST  
IS EXTREMELY LOW**

**N**OT all broaching jobs involve automatic fixtures, complicated holders and expensive tooling. Here is the simplest kind of a set-up . . . but one that increased production and lowered part costs materially. • The part is a 75 MM fuze body. The blank is turned on a screw machine and the five surfaces indicated have been machined previously. Then the slots in the sides are broached using the set-up shown above. The simplicity of the fixture is apparent since no locking or clamping device is required. The tools are slightly modified standard keyway broaches; simple and inexpensive. • Call a Detroit Broach engineer and find out about the jobs in your shop that might be broached. Let him give you full production and cost data. You will not be obligated in any way and he may be able to show you where you can increase production . . . lower costs . . . make more efficient use of manpower.

**MACHINED IN PREVIOUS OPERATION**



**BROACHED IN ONE OPERATION**

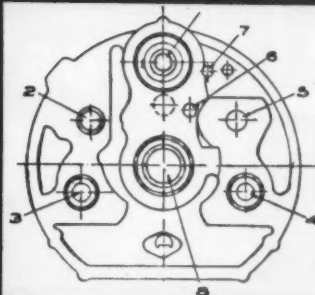


20201 SHERWOOD AVENUE  
9308 SANTA MONICA BLVD.

DETROIT, MICHIGAN  
BEVERLY HILLS, CALIFORNIA

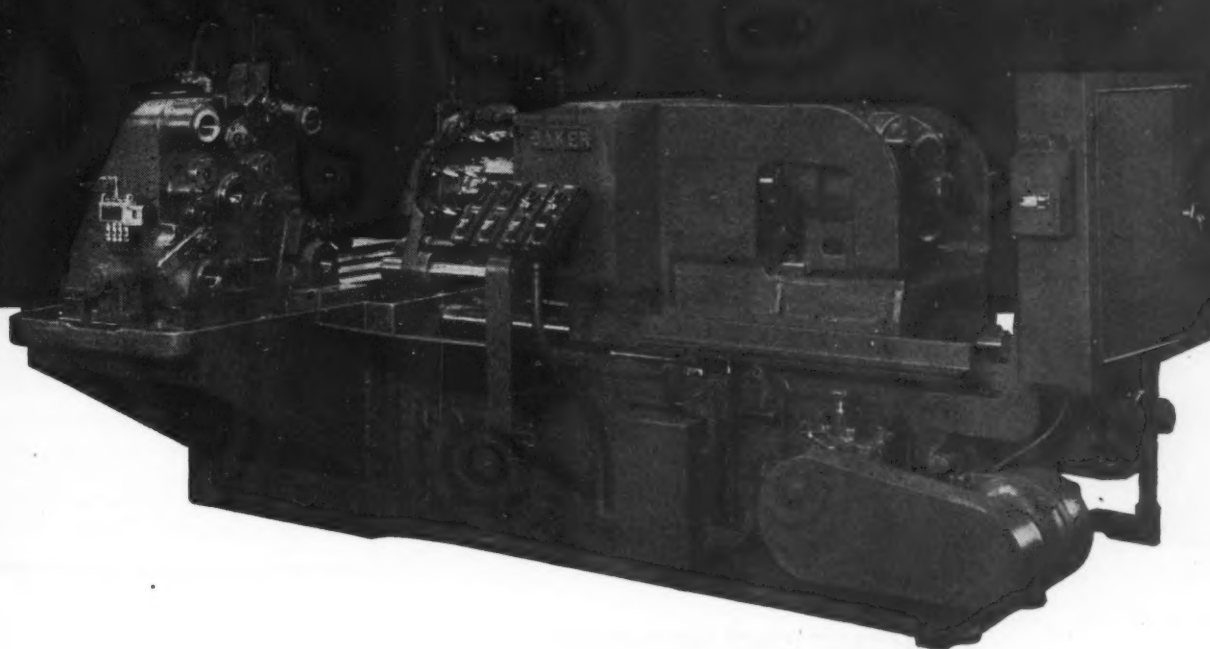


# BAKER NO. 3½ x 24 (FULLY AUTOMATIC CYCLE)



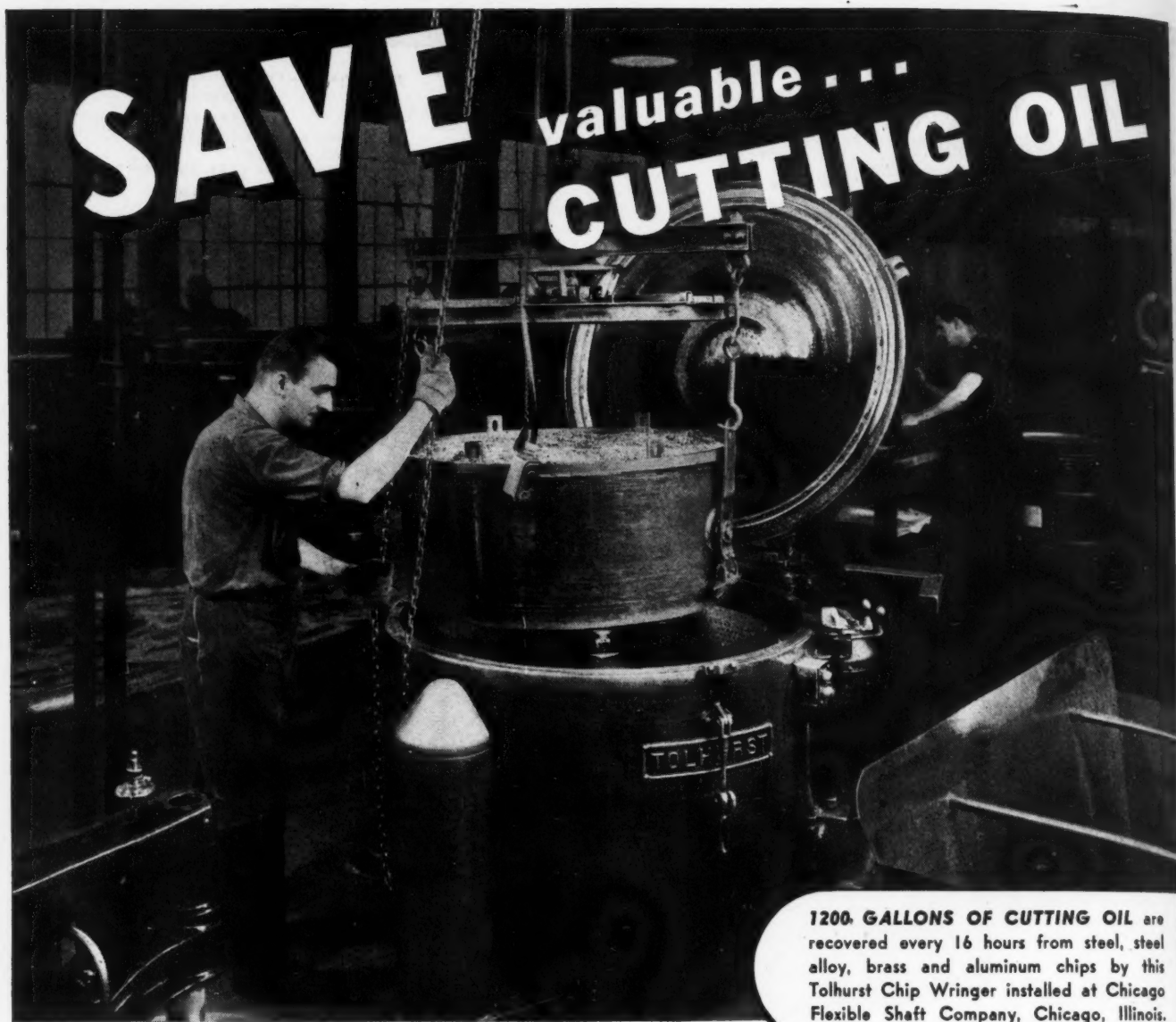
PART NAME - COVER MAT-MAGNESIUM  
OPERATIONS  
1ST STATION  
DRILL HOLES NO 1-2-3-4-5-6  
END MILL HOLE NO 7  
ROUGH BORE AND CTBR HOLE NO 8  
2ND STATION  
GROOVE-CTBR-BORE HOLE NO 1  
SEMI-FINISH BORE-CTBR HOLE NO 2-3-4  
SEMI-FINISH BORE HOLE NO 5  
FLAT DRILL HOLE NO 6  
CTBR-CHAMFER-BORE HOLE NO 8

*speeds* **MULTIPLE OPERATIONS**  
*ON complicated* **AIRCRAFT PART**



The photograph shows the setup on the Baker Model 3-1/2 x 24 One-way Horizontal Drilling Machine as applied to the machining of the aircraft part illustrated above. The photograph was taken with the Fixture to the front at "chucking position," at which point the operator loads, unloads and starts the cycle. The Fixture and Work automatically index for the sequence of operations (listed above) . . . first station: 8 spindles for drilling and rough boring . . . second station: 7 spindles for finishing operations, followed by automatic return to Chucking Station. Write Baker for engineering suggestion to solve your multiple drilling operations with similar success.



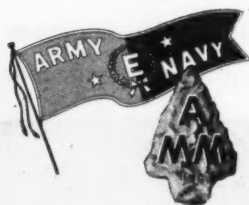


# SAVE valuable... CUTTING OIL

**1200 GALLONS OF CUTTING OIL** are recovered every 16 hours from steel, steel alloy, brass and aluminum chips by this Tolhurst Chip Wringer installed at Chicago Flexible Shaft Company, Chicago, Illinois.

**TOLHURST CHIP WRINGERS** recover up to 98.6% of valuable cutting oil from metal chips, through the application of *centrifugal force* only. The routine is very simple and unskilled help can efficiently operate Tolhurst Chip Wringers.

**REDUCE TOOL WEAR** A plentiful daily supply of fresh, reclaimed oil encourages a more conscientious use of cutting oil. Tool room records show reductions in tool wear run as much as 50% after installing Tolhurst equipment. Frequent collection and processing of chips result in cleaner floors and reduce the hazard of fire. Investigate Tolhurst Chip Wringers for conserving cutting oil — reducing tool wear. Details gladly sent upon request.



## TOLHURST CHIP WRINGERS

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 "Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"



# How to Grind

## GEAR-SHAPER CUTTERS

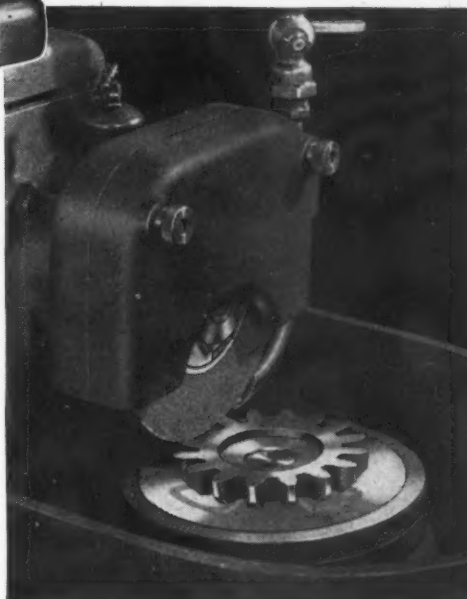
### on the Taft-Peirce

## 6" Rotary Surface Grinder

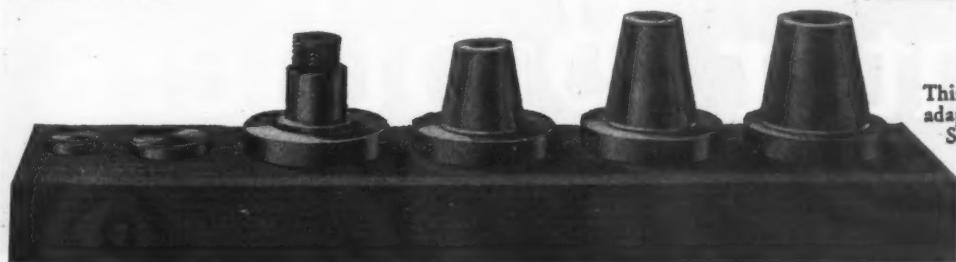
*Above*, T-P Surface Grinder for small rotary work up to 6" in diameter. Exclusive tilting wheelhead enables machine to do difficult angle and shoulder work.

*Immediate right*, grinding a threaded hole-type Fellows cutter, with Taft-Peirce adapter.

*Far right*, grinding a tapered shank-type Fellows cutter, with Taft-Peirce adapter.



The set of adapters, shown below, makes it possible to grind all Fellows Gear Shaper cutters quickly and accurately on the Taft-Peirce 6" Rotary Surface Grinder . . . to which the only alternative for this particular type of work is an expensive production machine. Chuck can be tilted 7°, and wheelhead spindle swivels in a vertical plane from horizontal to 30° below wheel center, thus facilitating grinding at any angle encountered in this type of work. Send for prices and delivery dates on Taft-Peirce adapters for grinding Fellows cutters.



*The*  
**Taft-Peirce**  
*Manufacturing Company*  
WOONSOCKET, R. I.



This is the complete set of six T-P adapters for grinding Fellows Gear Shaper Cutters. These adapters may be purchased either individually or in sets.





The degree of Accuracy that made WINTER TAPS the approved threading tools of a host of Nationally known manufacturers will serve you equally well on all YOUR tapping jobs. Give them the care you would any other precision tool and they will be cutting good threads long after you would normally expect to discard them.

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN

**Winter Brothers**  
COMPANY  Wrentham, Massachusetts, U.S.A.  
BRANCH STORES SAN FRANCISCO, CALIFORNIA - CHICAGO, ILLINOIS - DETROIT, MICHIGAN

**SLOW AND STEADY**



**...WITH NO SPEED VARIATIONS**

Recently, a manufacturer building secret military apparatus called for a small, compact electric motor that provided unfailing, uniform slow speed. Since standard "off the shelf" gear motors could not meet the strict performance and design specification, the only solution was a special motor.

Holtzer-Cabot motor development engineers tackled the job and designed a special synchronous gear motor that ex-

actly met all the operating conditions... and another military device was on its way to help win the war.

Today, Holtzer-Cabot is designing and building special fractional HP motors for war products, only. However, our motor development engineers, backed by over 50 years of experience in electric motor design will gladly cooperate with you on your motor requirements and problems for post-war products.

**SPECIAL MOTORS DESIGNED TO FIT THE APPLICATION**

**HOLTZER-CABOT**

Division First Industrial Corporation

**Designers and Builders of Special Fractional HP Motors and Electrical Apparatus**  
125 Amory Street, Boston 17, Mass. Chicago, Ill., New York, N. Y., Philadelphia, Pa.





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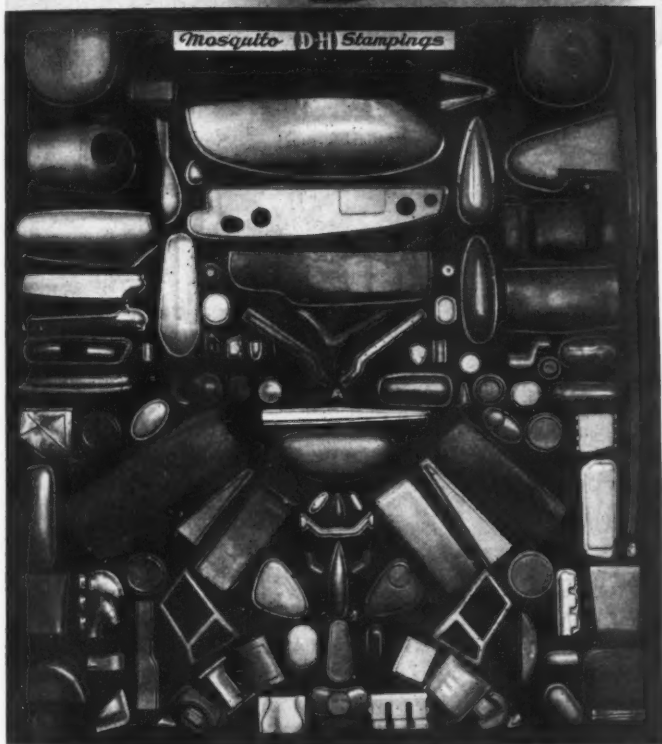
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# KIRKSITE\*

*They call it  
"the Mosquito"*

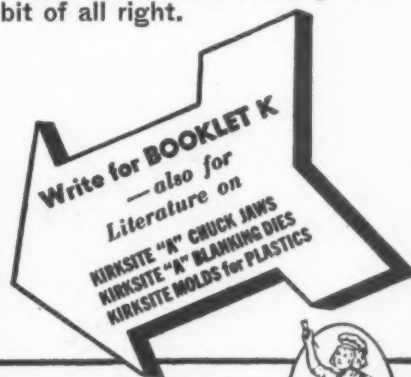
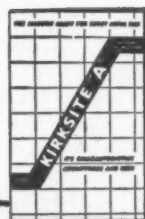


\* Trade Mark Reg. in U. S. Pat. Off. by  
Morris P. Kirk & Son, Inc., Los Angeles, a  
subsidiary of National Lead Co.

... but that's typical British understatement. In speed, range and striking power this DeHavilland medium bomber is a ferocious mosquito indeed!

The Mosquito is famed not only for its knock-out sting—it is also known far and wide as the "all-plywood bomber". That term, however, is an overstatement. Obviously the engines, armament and certain other equipment must be metal. But it may surprise you to learn that **ALL THE METAL STAMPINGS SHOWN HERE** are used in building the Mosquito. What shouldn't surprise you, though, is the fact that these stampings are made on Kirksite "A"\* dies.

There is no point here in reviewing the many virtues of Kirksite "A" as a die alloy... you know them by now. So, just let's borrow some British reserve and understatement and say that Kirksite "A" is a bit of all right.



**NATIONAL LEAD COMPANY, 111 Broadway, New York 6, N.Y.**

*Branches In All Principal Manufacturing Centers*





**"Here's the kind  
of hand protection  
every welder wants"**



Ask a welder what he wants in a glove . . . and he'll tell you he wants protection with plenty of working comfort.

Take this pair of American Optical gloves. They're gun-cut—which means they have seamless palms—and the finger seams are flat to guard against chafing and blistering. And they're made of top quality chrome tanned cowhide that *stays* pliable. This can make the difference between an ordinary welding job and a good job. For *pliable* gloves give better control of both rod and torch. They help welders do faster, more uniform work.

The seams on AO gloves are located away from the parts that get the most heat and wear. That's why AO gloves can take plenty of punishment, too.

If you want to step up your welding production—and who doesn't these days—give AO gloves or mittens to *your* welders.

You'll find the Representative of your nearest AO Branch Office can help you choose the proper gloves and mittens from AO's welding line. Why not call him sometime today?

**American  Optical**  
COMPANY  
SOUTHBRIDGE, MASSACHUSETTS



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GAMMONS - HOAGLUND CO.

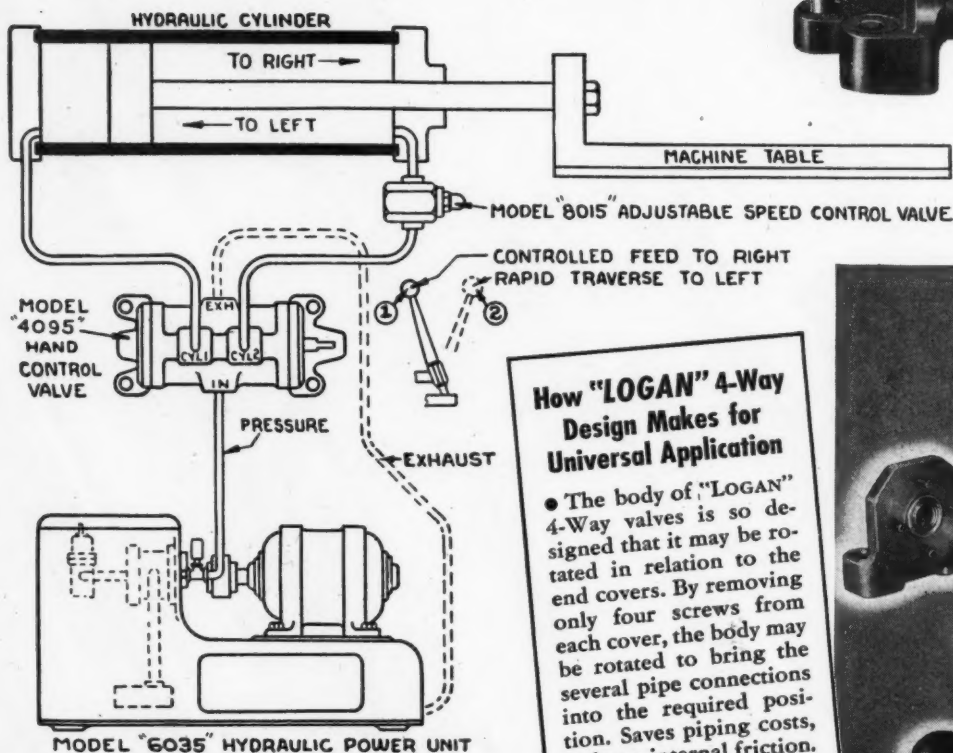
MANCHESTER, CONN.



# "LOGAN" CONTROL

# Hydraulic VALVES

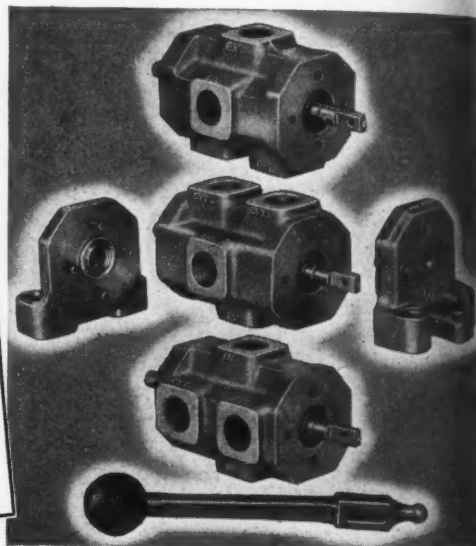
Hand, Foot, Solenoid, Cam, Pilot,  
and Latch-Operated 4-Way Types.  
Relief, By Pass, Pressure-Regulat-  
ing—Feed and Pilot Operating.



● Model 4095—hand operated valve  
—for oil service only. Maximum pres-  
sure, 1500 lbs. P. S. I.

## How "LOGAN" 4-Way Design Makes for Universal Application

● The body of "LOGAN" 4-Way valves is so de-  
signed that it may be ro-  
tated in relation to the  
end covers. By removing  
only four screws from  
each cover, the body may  
be rotated to bring the  
several pipe connections  
into the required posi-  
tion. Saves piping costs,  
reduces internal friction.



**T**HE application chart above illustrates one of the simpler hydraulic circuits obtained through the use of "LOGAN" standard hydraulic equipment. In this circuit Model 4095 hand valve and Model 8015 adjustable speed control valve are used to produce a feed stroke to the right and a rapid traverse to the left. When the handle is at the No. 1 position, oil flows through control valve to left end of cylinder, moving machine table to right. Oil from right end is metered through the Model 8015 speed control valve, controlling the feed. No. 2 position reverses the flow. Pressure is furnished by the standard "LOGAN" Model 6035 power unit.

## For all Types of Hydraulic Circuits

● "LOGAN" 4-way piston type hydraulic valves meet practically all requirements for hand or semi-automatic control. The rotating principle of design described above eliminates the use of special valves, minimizes internal friction and reduces labor costs for piping the hydraulic circuit by eliminating elbows and street ells. This exclusive feature makes these "LOGAN" valves applicable to practically all types of hydraulic circuits. "LOGAN" valve bodies are made of high grade chrome-nickel cast iron, with hardened alloy steel pistons. These sturdy, precision-built valves insure accurate, dependable control and long, trouble-free service. A complete range of sizes from  $\frac{1}{4}$ " to 2" is available, for maximum pressure of 1500 lbs. P. S. I. Write for Catalog 80, Section 3.



**LOGANSPORT MACHINE CO., INC.**  
910 Payson Road, Logansport, Indiana

**"LOGAN" Air and Hydraulic Equipment**  
CHUCKS \* CYLINDERS \* VALVES \* PRESSES \* SURE FLOW COOLANT PUMPS

# Better Drop Forgings

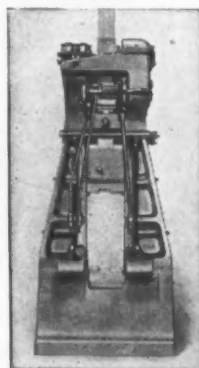
from Model J-2

## CHAMBERSBURG Board Drop Hammer

In these war years when metal parts have been tested in the destructive jaws of the war machine and either discarded or ordered in increasing numbers, drop forgings have proved once again their essential value.

And for those drop forgings that can be made on the board drop hammer, the Chambersburg Model J-2 Hammer offers a greater degree of precision forging over a longer period of time.

Forgings made on this efficient hammer can be made to closer tolerances, are more uniform in quality and can be produced in greater quantities per hour.



*Rear of Hammer showing Simplicity of Design.*

The motor driven head is the acme of simplicity and quietness. The clean, well-proportioned lines of the hammer as shown in the illustration are indicative of the heavy, well-balanced anvil and frames.

*Further details are described in Bulletin 252-2.  
Write for a copy.*

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



# CHAMBERSBURG

HAMMERS · CECOSTAMPS · PRESSES



**meet...**

## A SOLDIER ON THE HOME FRONT

Operating strictly on the offensive, the "Unbrako" Hollow-Set Screw with the knurled point has vibration licked at the start. Applied in the usual manner, the KNURLS dig in and the "Unbrako" hangs on with a grip that can't be shaken off no matter how hard the machinery vibrates, though in action day and night. . . . There's a vast army of these "Unbrako" Self-Lockers on duty in war plants all over the country and in thousands of machines, tools and implements rolling off production lines—keeping maintenance costs and worries down by infallibly holding parts together under any and all conditions. And they're good for many "engagements" because they're easily removed with a wrench—can be re-used any number of times.

Sizes: No. 4 to 1½" diameter.

Get the "Unbrako" Catalog

OVER 40 YEARS IN BUSINESS

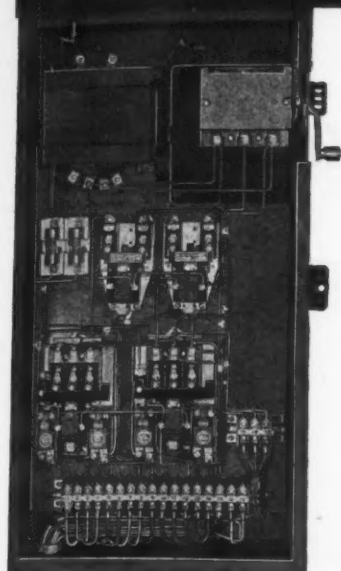
**STANDARD PRESSED STEEL CO.**

JENKINTOWN, PENNA., BOX 22 BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

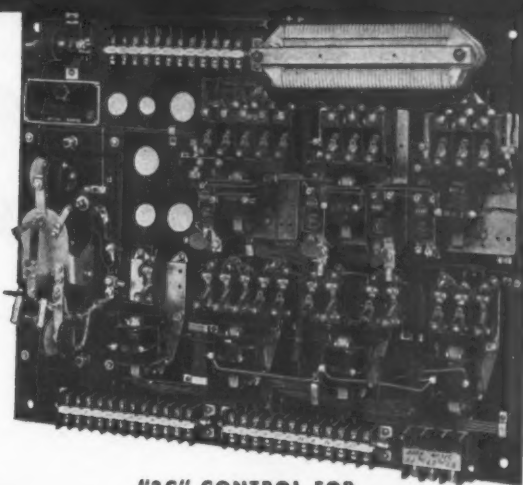


Knurling of Socket Screws originated with "Unbrako" years ago.





**SPECIAL "3C" MACHINE  
TOOL CONTROL PANEL**



**"3C" CONTROL FOR  
HORIZONTAL BORING MILL**

"3C" Control Apparatus, long standard in heavy duty applications, is proving its merit in thousands of wartime machine tool operations.

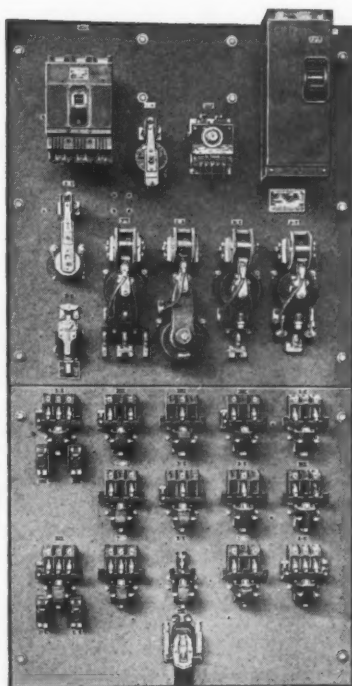
Each "3C" contactor, relay, push button or other control device is designed to stand up under frequent operation in heavy duty service.

"Will it deliver production line service?" is the first question asked of our apparatus, for continuous START-STOP operations demand exceptional service and durability.

This built-in durability is demonstrating its fitness in 24 hour per day service, where electrical control, as well as motors and machines are run by several different operators.

"3C" Accessory Devices, such as Cam Limit Switches, Hatchway Limit Switches, Foot Switches, Push Buttons in countless combinations, are also helping production efforts with low maintenance operation.

"3C" Control is readily engineered to your particular needs.



**SPECIAL CRANKSHAFT  
MACHINE CONTROL**

**STREAMLINED CABINET  
WITH LOUVRED TOP  
FOR HOUSING RESISTORS**



**OFFICES IN PRINCIPAL CITIES**

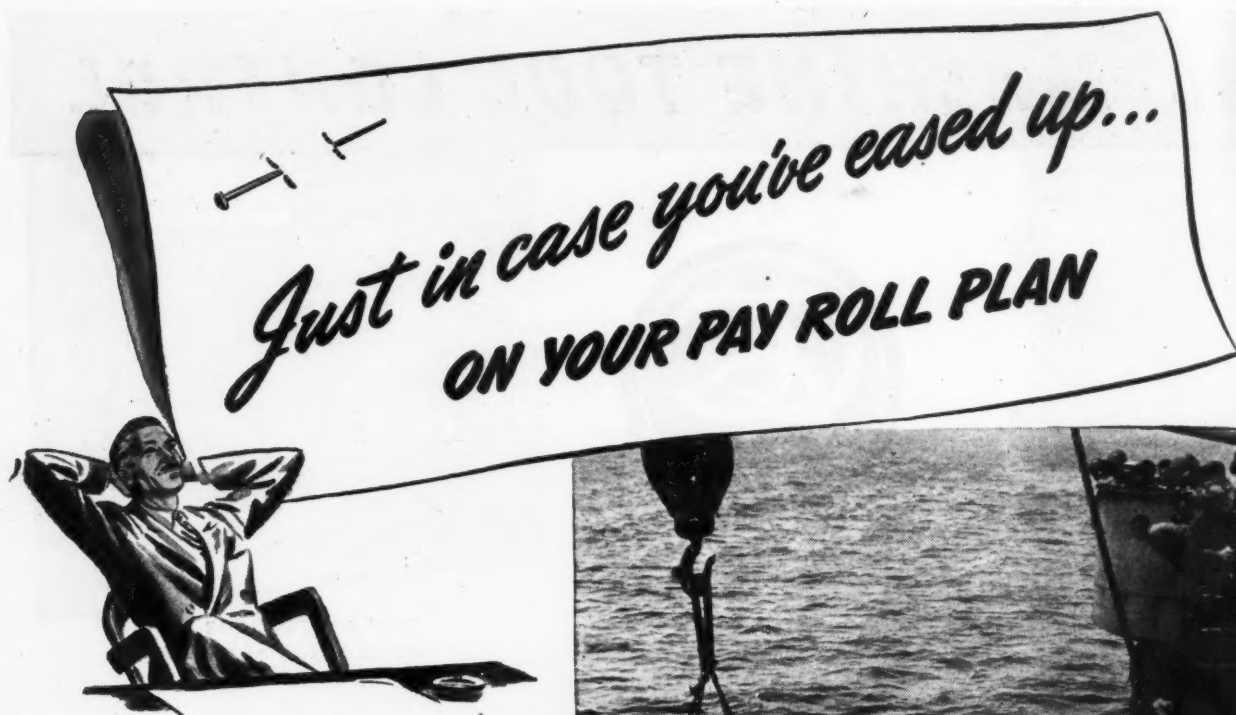


**THE CLARK CONTROLLER CO.**

**1146 EAST 152<sup>ND</sup> ST.**

**CLEVELAND, OHIO**





Pause one brief moment. Compare your lot—and that of the men and women in your employ—with the lot of the infantrymen who meet the enemy face to face, who do the hardest fighting, who suffer the most casualties.

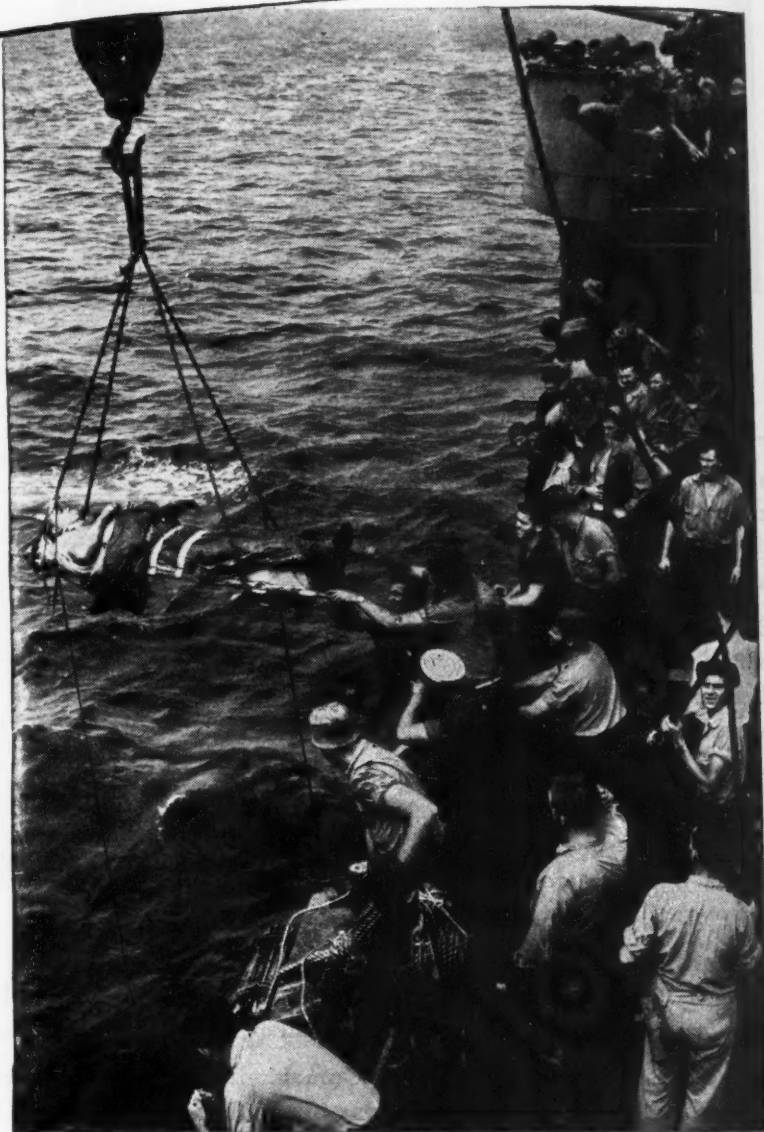
Let the full impact of war's unending grimness swiftly convert any tendency toward complacency into revitalized urgency. Remember—the war is not yet won.

As top management and labor, you've been entrusted with two major responsibilities—steadily maintained production, and steadily maintained War Bond Sales *through your Pay Roll Savings Plan.*

Decide *now* to revitalize your plant's Pay Roll Plan. Have your Bond Committee recheck all employee lists for percentages of participation and individual deductions. Have Team Captains personally contact each old and new employee. Raise all percentage figures wherever possible.

Don't underestimate the importance of this task. This marginal group represents a *potential sales increase of 25% to 30% on all Pay Roll Plans!*

Your success will be twofold: A new high in War Bond Sales; and a new high in production. Because a worker with a systematic savings plan has his mind on his work—not on post-war financial worries. He's taking care of the future now. His own. And his Country's future. *Help him! REVITALIZE YOUR WAR BOND PAY ROLL SAVINGS PLAN.*



Official U. S. Coast Guard Photo: The elevator to a Coast Guard-operated transport hospital



***Back the Attack!***  
**SELL MORE THAN BEFORE!**

*The Treasury Department acknowledges with appreciation the publication of this message by*

**MACHINERY**

*This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.*

Deliveries NOW Within 30 Days





with  
ge by

HERE's a typical, everyday use for Johansson Gage Blocks—a time-saver that makes real inspection accuracy a simple, rapid-fire operation. Using a stack of Jo-BLOCKS and an ordinary surface gage, set your dial indicator at zero on the blocks—if the work measures zero too, it's *right*. Hundreds of other uses, such as in tool set-up, in laying-out, in scribing, in checking mikes and working gages. Popular Set No. 1, of 81

blocks, makes 120,000 different size gages, in steps of .0001 from .200 of an inch to more than 12 inches. Jo-BLOCKS are much lower in price than most folks think. Two grades—

accurate to .000004 and to .000008. Write for catalog 16. Address: FORD MOTOR COMPANY, Johansson Division, Dept. M, Dearborn, Michigan.

  
**Johansson**  
  
**GAGE BLOCKS**

MACHINERY, August, 1944—335





**Specialized  
WORK IMPROVES  
WITH SPECIAL  
DRILLS**

*... Choose the  
type from  
the famous  
COGSDILL  
LINE*

*Write for  
Catalog*



### **WANTED: Quality Distributors for Cogsdill Products**

A limited number of Cogsdill Distributorships are available in territories not now represented. Only reputable, well established distributors of machine shop equipment and supplies need apply. Excellent profit potentialities now and in the highly competitive markets of peacetime. Write fully and in confidence to: Cogsdill Twist Drill Co., Box 97, College Park Station, Detroit, Mich.

## *a Suggestion* TO OWNERS OF **Bodine MACHINES**



**FOR TRAINING  
YOUR *New*  
ESSENTIAL WORKERS  
*Easier...  
and Faster!***

Production requirements in this critical war year are shifting men to essential work. Most of them are not mechanically minded.

It is the responsibility of war plants to make them productive employees as quickly as possible... so we suggest that you train them to operate Bodine machines.

**Here are sound reasons  
for such action:**

1. Bodine automatic operation can be taught in weeks instead of months.
2. Men and women of fair intelligence quickly reach high production rates.
3. Damage to machines, tools, and work is prevented by automatic devices... which also protect the operator.
4. Operating Bodine machines is clean, healthy work... at low fatigue factor... a contribution to defeat of absenteeism.
5. Bodine operators clearly see how well they fit into war work... are contented with their effort to help win victory.

This procedure may permit advancement of older experienced operators to more difficult jobs... for improved all-around production.

**DRILLING, MILLING, TAPPING, SCREW INSERTING**  
*Simultaneously*

**BODINE does this:**

- Builds 6 standard models, develops the particular tooling for the work to be done.
- Permits Milling, Drilling, Tapping, Screw Inserting, one or all operations, during one cycle of the dial... with manual or hopper feed... manual or automatic ejection, depending upon the nature of the work.
- Allows greatest flexibility in tooling set-ups for a wide range of work.
- Provides compact design in all machines. Floor space requirements 54" x 60" for small... 90" x 96" for large size.

**THE  
Bodine  
CORPORATION**  
BRIDGEPORT CONNECTICUT  
AUTOMATIC DIAL TYPE DRILLING, MILLING,  
TAPPING, AND SCREW INSERTING MACHINES

### **Speed Treat Savings**

66% Lower Material Cost

Better Machinability and Finish

Weight Is Reduced

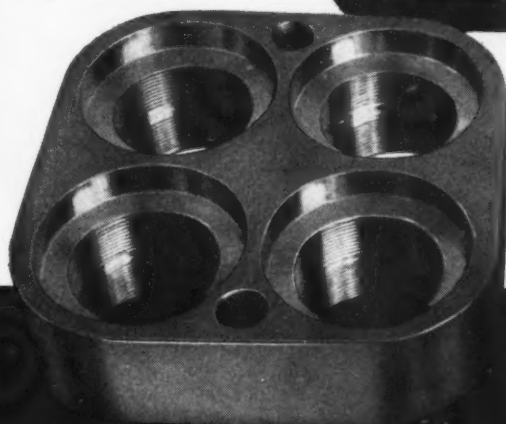
Better Heat Treatment Response  
(pack hardening produces an  
.050" case and a uniform hard-  
ness of 61-62 Rockwell "C")

Heat Treatment Distortion Is Negli-  
gible

Danger of Die Breakage Due to  
Faulty Alignment Is Eliminated

Production Costs Are Minimized

Pictured is a 7" x 7" x 1 7/8" compression mold die of *Speed Treat* plate, used on a 60-ton press for making ordnance parts. Cavities are 3" dia.; wall between cavities .250"; outer walls .375". Note split construction of male die heads which would be impractical in tool steel (because of tendency to crack), yet over 500,000 impressions have so far been made from a similar set of *Speed Treat* dies. Female die must be removed from press after each impression to remove finished parts. Smaller metal section and lighter weight of *Speed Treat* dies is liked by women operators. *Speed Treat* replaced tool steel costing three times more, yet machinability and finish of *Speed Treat* are far superior and distortion after heat treatment is practically nil.



*Speed Treat* steel plate lends itself to economical production of plastic dies, all types of mechanical rubber molds, many types of blanking, drawing and forming dies, roller dies, brake dies and miscellaneous jigs and fixtures.

A .50 carbon free machining hot rolled steel plate, *Speed Treat* affords high physical and good hardenability properties formerly found only in expensive grades of special analysis steel.

High tensile strength, free machinability, ready hardenability and constant uniformity are features of *Speed Treat* plate. It responds excellently to all types of heat treatment.

If you are still tooling up on war jobs or planning your postwar tool and die production, try out *Speed Treat* carbon steel plate now to learn of its many superior economy values. *Speed Treat* costs only one-third as much as water hardening tool steels.

Send for Catalog No. 1243 and the name of your local *Speed Treat* plate distributor

**W. J. HOLLIDAY & CO.**

"Established 1856"

Hammond and Indianapolis, Indiana

*Speed Case—Speed Treat* Plate Division,  
Hammond, Indiana

Distributors in Principal Cities

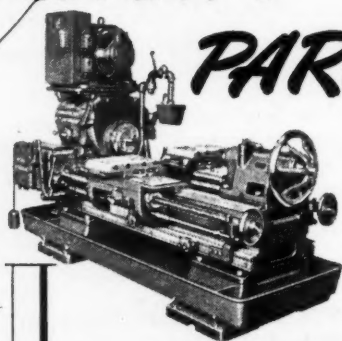
Quality Controlled *Speed Case* and *Speed Treat* Steel Is Available in All Common Plate Sizes

*Do it with a*  
**DUOMATIC**



## USE MULTIPLE TOOLS TO BEST ADVANTAGE

*ON*  
**AIRCRAFT**  
**PARTS**



The DUOMATIC—Lodge and Shipley's full automatic Lathe—has greatly enlarged possibilities of multiple tools in lathe operations.

Shown in the illustration above are seven tools front and seven tools rear performing a complex semi-finishing operation, turning and facing an aircraft engine component. Also shown is a special coolant piping arrangement.

The dual tool slides, front and rear, can be swiveled to cut from any angle. As a result, any combination of turning, and straight or angular "in" or "out" facing cycles are obtainable . . . front and rear, singly or together.

The numerous features on the DUOMATIC are truly a major advance in automatic lathe design. This Lathe operates with equal efficiency and versatility on large or small lots . . . sets new performance records in the production of every type of aircraft part. Write for complete details.

ENGINE • AUTOMATIC • TOOL ROOM • OIL COUNTRY LATHES

THE **L** **D** **O** **D** **G** **E** & **S** **H** **I** **P** **L** **E** **M** **A** **C** **H** **I** **N** **E** **T** **O** **O** **L** **C** **O**

*CINCINNATI 25, OHIO, U. S. A.*





# DIMENSIONAL ACCURACY

ONE OF THE 5 THINGS  
TO LOOK FOR WHEN  
YOU BUY GAGE BLOCKS



*Look for these 5 things when  
you buy Gage Blocks -*

1. Dimensional Accuracy
2. Stability
3. Surface Finish
4. Wearing Quality
5. Service after the sale

The first requirement of gage blocks is that the surfaces are absolutely flat—opposed surfaces are parallel and all surfaces are accurate to sizes indicated on the blocks.

Every Webber Gage Block is subjected to an exhaustive series of tests and inspections which guarantee that all requirements of dimensional accuracy are met.

To further assure the ultimate accuracy of these blocks, the final tests are made in air conditioned, temperature-controlled rooms.

It is this faithful attention to minute details—a thorough knowledge of gage block manufacture gained through long years of experience that enables Webber to produce, in quantity, gage blocks of dependable dimensional accuracy.

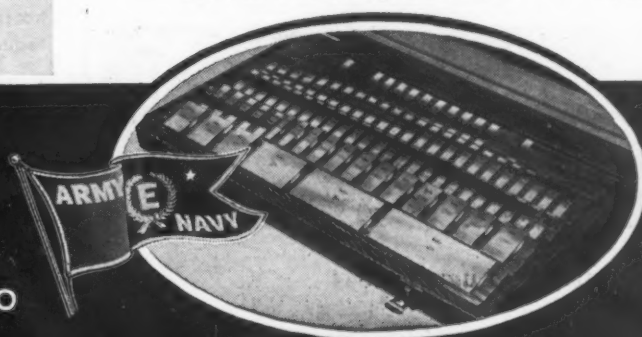
Webber Gage Block Sets are available in the following range of sizes:

Set No. 84A . . . . .	\$350.00
Set No. 84B . . . . .	\$235.00
Set No. 43A . . . . .	\$185.00
Set No. 43B . . . . .	\$150.00
Set No. 38A (Thin Blocks) . . . . .	\$195.00
Set No. 38B (Thin Blocks) . . . . .	\$155.00
Set No. 14A (Angle Blocks) . . . . .	\$450.00

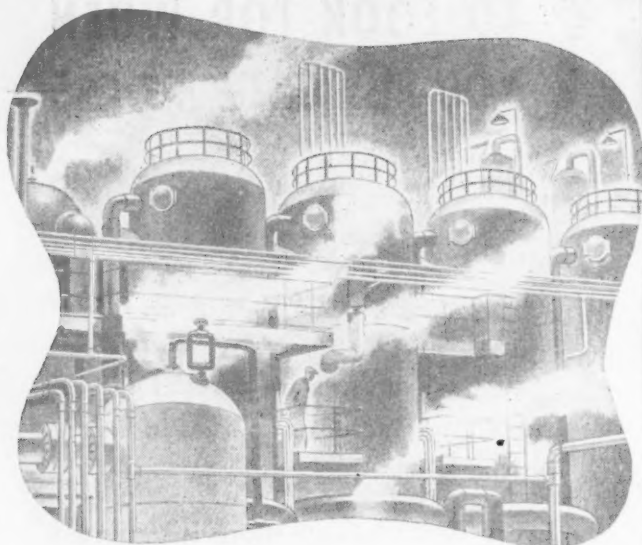
## Webber

### GAGE COMPANY

12909 TRISKETT RD., CLEVELAND 11, OHIO



INDUSTRY'S NEW SOURCE OF CONTROLLED POWER



## Fluid Power

### MAKES MOLECULES BOUNCE!

In synthetic rubber plants, Fluid Power helps pry the molecules apart and squeeze them into new combinations. Liquids and gases are measured, mixed and transformed to meet the exacting standards of chemical formulas.

Fluid Power is transmitted through tubes. It helps to drive, control and regulate... all the way through from the raw ingredients to the bouncing tire.

Fluid Power is simple, dependable. And that's an essential in the complex operations of rubber and chemical plants and modern oil refineries. Whether the job calls for precision timing or powerful, remote control, Fluid Power does it efficiently—and without coddling!

Where and how can Fluid Power be put to work for you? The applications are limitless. A Parker engineer will be glad to discuss your problem with you.

#### AT YOUR SERVICE...FLUID POWER ENGINEERING

Solving power and control problems...engineering new Fluid Power systems is the day-to-day job of Parker engineers. In the marine, railroad, petroleum, Diesel, refrigerator and machine tool and other industries, they are developing new and interesting applications which you should know about. Ask a Parker engineer, or write direct to The Parker Appliance Company, 17325 Euclid Ave., Cleveland 12, Ohio.



## A Tool Room SURFACE GRINDER That HOLDS Precision Accuracy



BOYAR-SCHULTZ

### No. 618 SURFACE GRINDER

DESIGNED to meet the demand for precision in the most exacting tool and die work, this Boyar-Schultz Surface Grinder is engineered to maintain that high degree of accuracy through long continuous work.

Spindle is specially designed, dynamically balanced and equipped with super-precision, pre-loaded ball bearings; operates smoothly and quietly at 3,000 R.P.M.

Table of close grained Meehanite moves longitudinally only, and on hardened and ground tool steel ways — one V and one flat. Cross feed is provided by the vertical column assembly supported on horizontal tubular steel ways which are ground and lapped to fit, assuring long sustained accuracy.

Write for circular describing this smooth running, easy handling machine tool.

**BOYAR-SCHULTZ CORPORATION**

WALNUT STREET AT HOYNE CHICAGO 12, ILLINOIS

# Automatic Grinding

**LATEST DEVELOPMENT IN MASS PRODUCTION  
OF BEVEL GEARS FOR AIRCRAFT ENGINES  
... for accuracy, strength and long-life**



**GROUND ZEROL BEVEL GEARS  
FOR AIRCRAFT ENGINES**

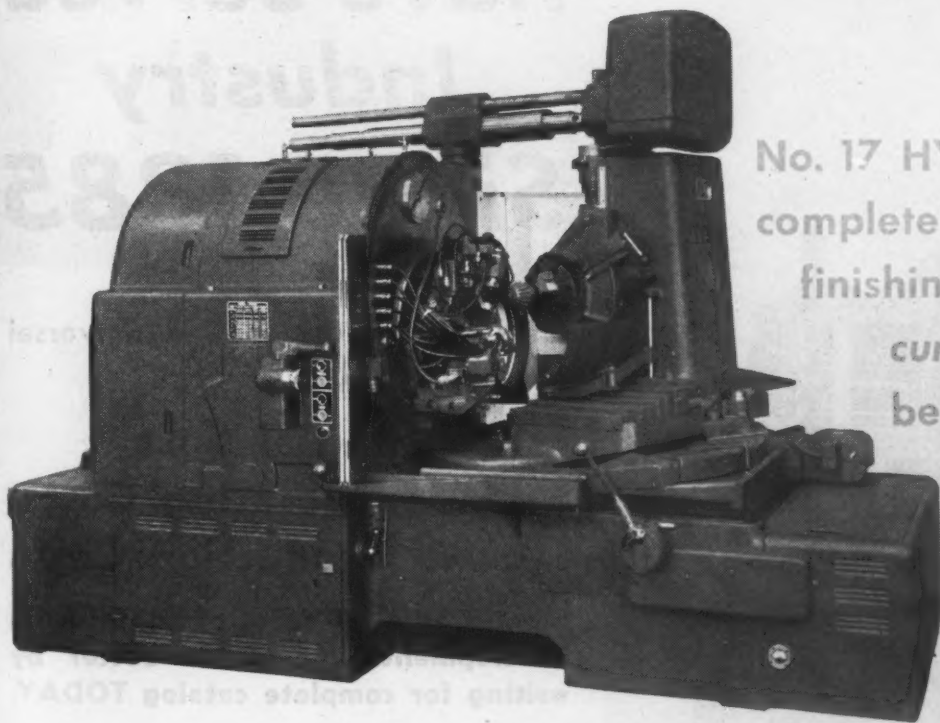
This planetary bevel gear reduction unit provides large power capacity in a small space for an airplane propeller drive. The teeth are ground after hardening to assure uniformity of all teeth.

## ADVANTAGES

- 1. Highest precision at mass production rates.**  
Grinding produces greatest possible accuracy of tooth spacing, profile, fillet radius and concentricity. Smooth fillet radii are obtained and tooth profile, fillet and bottom land are blended into one continuous curve.
- 2. True interchangeability of all gears.**  
Automatic operation eliminates the variable human

element, assuring complete uniformity of all gears of a lot—for tooth size, tooth bearing and surface finish.

- 3. Ease of operation simplifies production.**  
The simplicity of automatic operation permits use of unskilled operators. Also, each operator can handle a greater number of machines, with consequent savings in manpower and labor cost.



**No. 17 HYPOID GRINDER**  
completely automatic for  
finishing the teeth of  
curved-tooth  
bevel gears.

Send in prints of your bevel gear drives to the Gleason Works. We will be glad to show you how automatic grinding will improve their operation and solve your bevel gear production problems.



# GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.



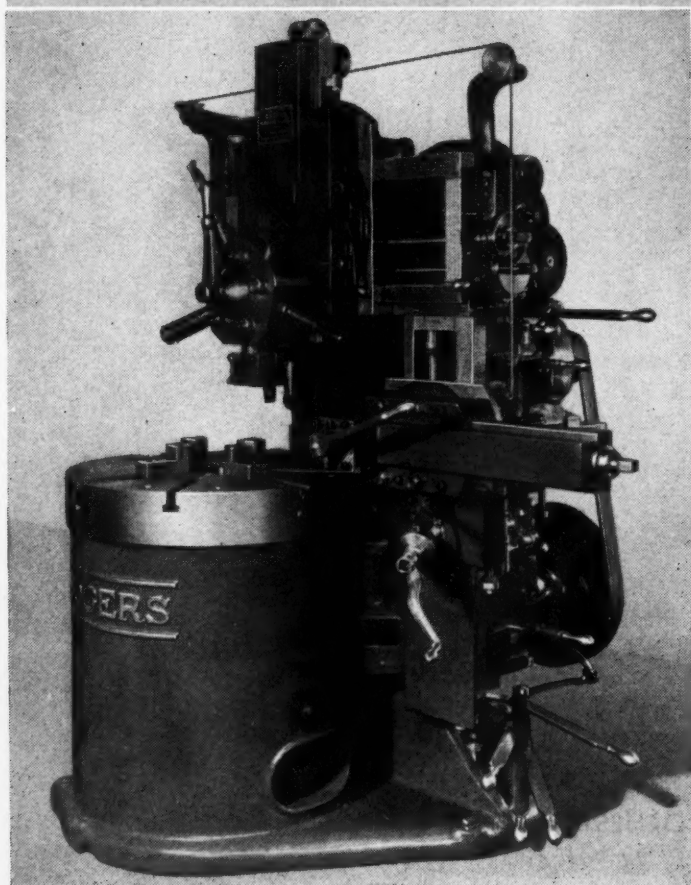


# ROGERS

# "Perfect 36"

## VERTICAL TURRET MILLS

**Have Served  
Industry  
Since 1885**



Simplicity of design and universal adaptability assure—

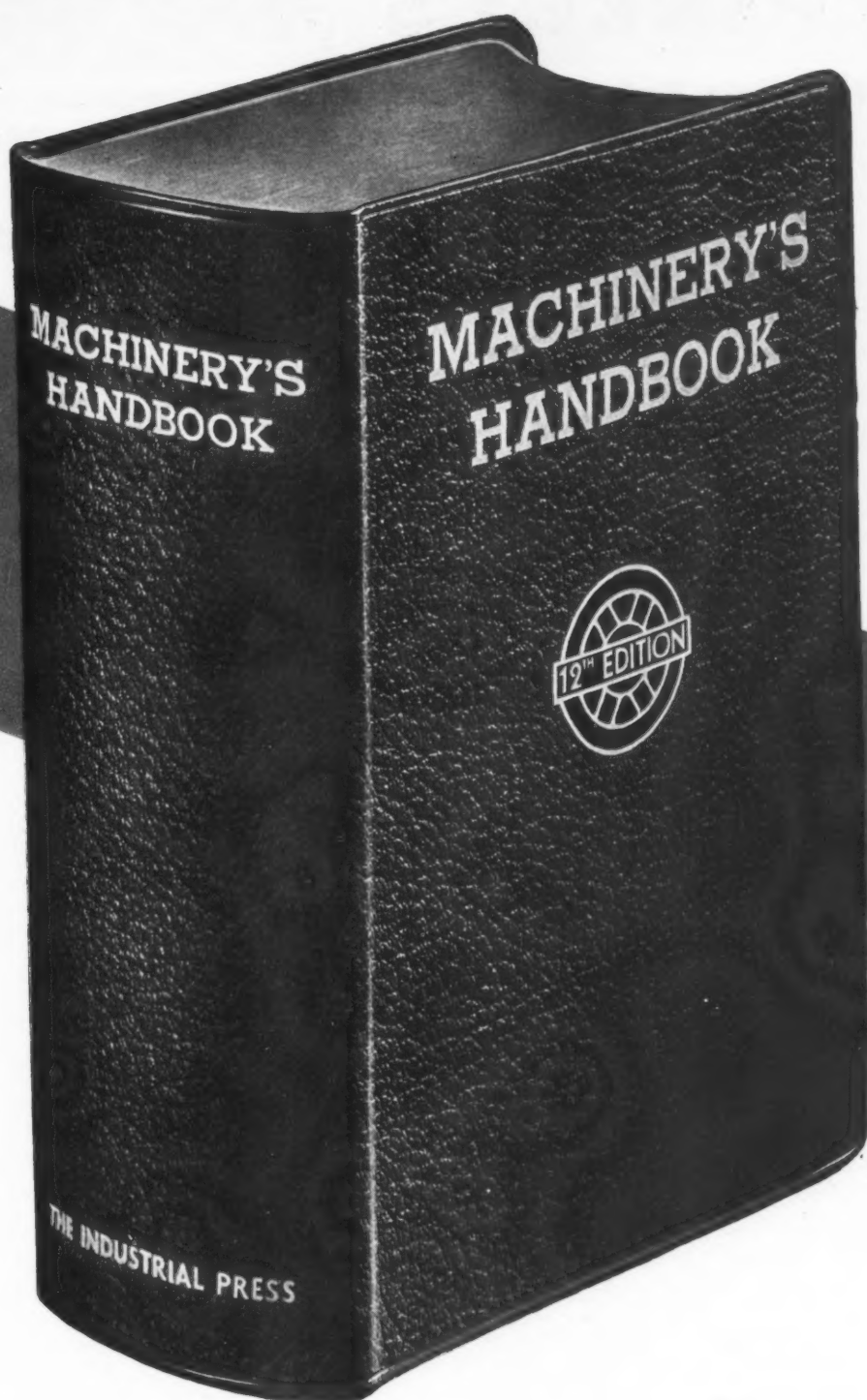
**LOW Initial Cost  
LOW Operating Costs  
LOW Production Costs**

Inquire how 59 years of engineering developments can do it better by writing for complete catalog TODAY.

**ROGERS  
MACHINE WORKS, INC.**

Sales Offices: 1809 Elmwood Ave., Buffalo, N. Y.  
Factory: Alfred, N. Y.

KNOWING HOW SINCE 1885



**MACHINERY'S HANDBOOK** (now in its Twelfth Edition) is one of the truly great engineering reference books of the world. It meets the requirements of engineers and machine designers but is not "above the heads" of men in machine shops and tool rooms. About 625,000 copies have gone out into every nook and corner of the globe. Here is a standard Handbook which is thoroughly practical from cover to cover. Contents next page.

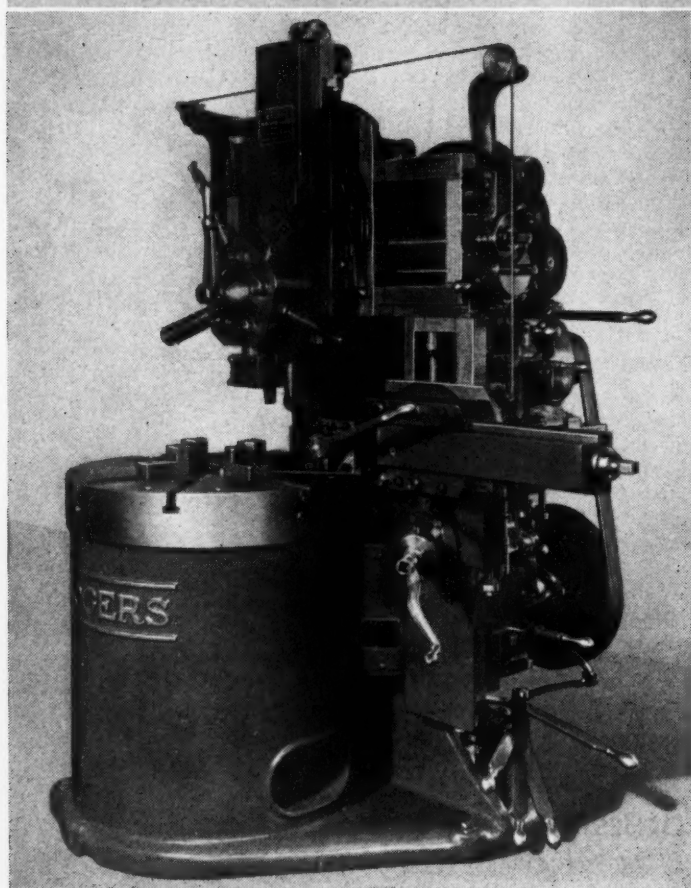


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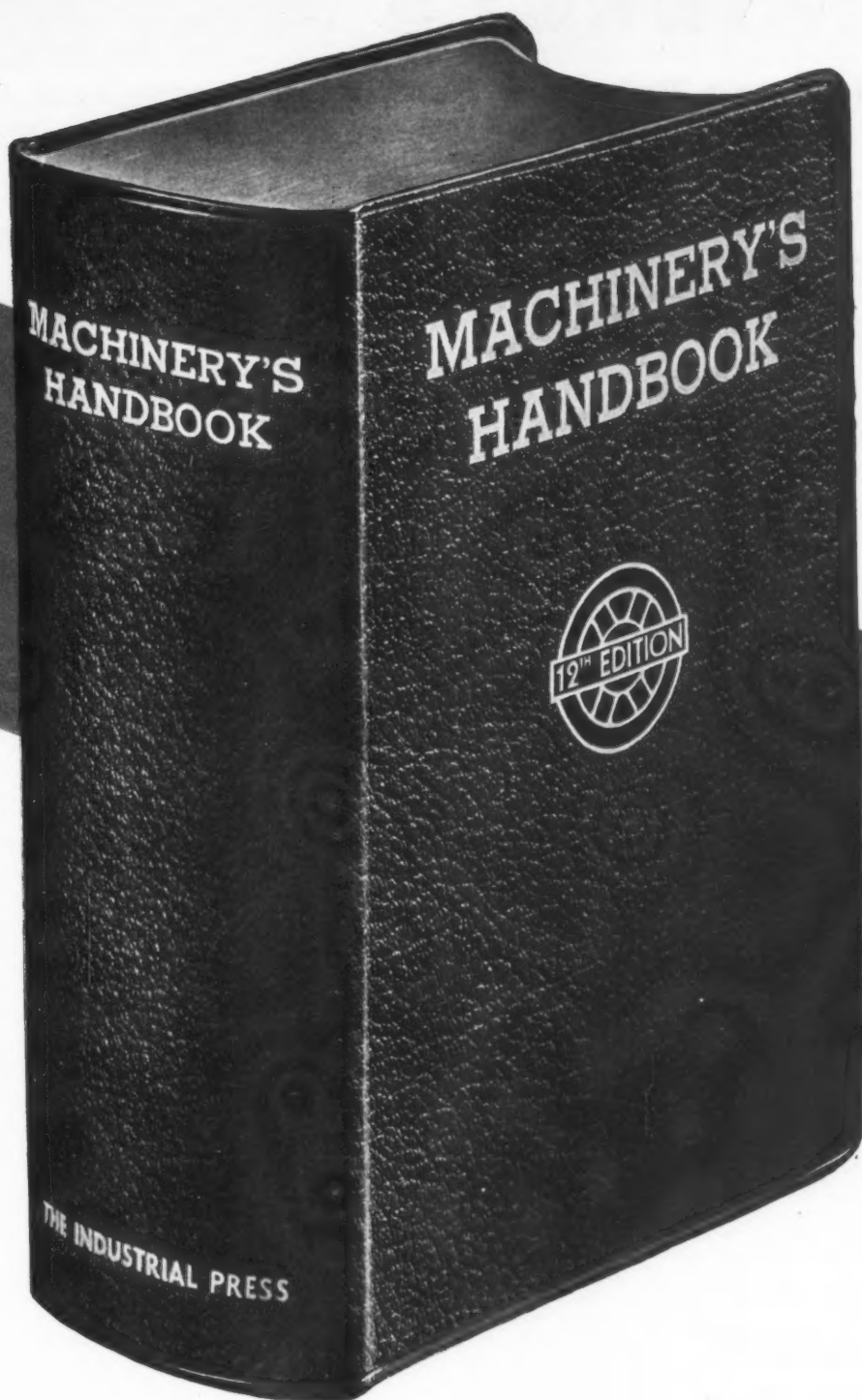
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# MACHINERY'S HANDBOOK

**An Engineering Reference Book used Throughout the World  
by the Designers and Builders of Everything Mechanical**



**1815 Pages—1310 Illustrations**

**For Mechanical Engineers  
For Machine Designers  
For Tool Designers  
For Shop Executives  
For Skilled Mechanics  
For Engineering Students  
For Shop Training Courses**

Below is a list of the 136 main subjects or divisions in MACHINERY'S Handbook. These main sections include thousands of items which may be located readily by a very complete index at rear of book. A special thumb index (see illustration above) provides for opening the book instantly to any of the fourteen main divisions most frequently consulted.

Powers and Roots of Numbers  
Circumferences and Areas of Circles  
Circles and Spheres  
Squares and Polygons  
Prime Numbers and Factors  
Transposition of Formulas  
Ratio and Proportion  
Percentage  
Interest  
Alligation  
Arithmetical and Geometrical Progressions  
Mathematical Signs and Abbreviations  
Positive and Negative Numbers  
Equations  
The Slide-rule  
Logarithms  
Hyperbolic Logarithms  
Calculation of Plane Figures  
Calculation of Solids  
Pappus or Guldinus Rules  
Contents of Cylindrical Tank at any Level  
Circles and Equivalent Squares  
Solution of Triangles  
Natural Trigonometric Functions  
Logarithms of Trigonometrical Functions  
Minutes and Decimals of a Degree  
Geometrical Propositions and Problems  
Composition and Resolution of Forces  
Mechanical Powers  
Center of Gravity  
Moments of Inertia  
Motion, Force and Work  
Radius of Gyration  
Centrifugal Force  
Flywheels  
Radians  
Factors of Safety  
Strength of Metals and Other Common Materials  
Moments of Inertia Tables  
Punch and Shear Frames  
Properties of Shafts, Standard Pipe, and Structural Shapes  
Section Moduli of Rectangles  
Beams

Structural Timbers  
Strength of Columns  
Strength of Flat Plates  
Strength of Cylinders  
Riveting and Riveted Joints  
Wire and Sheet-Metal Gages  
Wire Rope  
Spring Design  
Strength of Shafting  
Friction  
Bearings  
Lubricants  
Keys and Keyways  
Clutches and Couplings  
Friction Brakes  
Cams and Cam Design  
Spur Gearing  
Bevel, Spiral Bevel and Hypoid Gearing  
Worm-gearing  
Spiral or Helical Gearing  
Herringbone Gears  
Epicyclic or Planetary Gearing  
Ratchet Gearing  
Gear Measurement  
British Gear Standards  
Belts and Pulleys  
V-Belt Drives  
Pulley and Gearing Speeds  
Rope Transmissions  
Chain Transmissions  
Crane Chain and Hooks  
Standard Bolts and Nuts  
Standard Screws  
Standard Wire Nails and Spikes  
Cutting Speeds and Feeds  
Tool Grinding  
Forming Tools  
Miscellaneous Automatic Screw Machine Tools  
Stock for Screw Machine Products  
Thread Rolling  
Tapping  
Change Gear Ratios  
Oils and Compounds for Machining Operations  
Tolerances  
Tolerances for Different Classes of Fits

Screw Thread Tolerances and Allowances  
Sine-Bar Table  
Angles and Tapers  
Gages  
Helical or Spiral Milling  
Dividing or Indexing  
Jigs and Fixtures  
Grinding and Polishing  
Standard Grinding Wheels  
Laps and Lapping  
Punches and Dies  
Drop-forging Dies  
Broaches and Broaching Files  
Screw Thread Systems  
Measuring Screw Threads  
Taps and Threading Dies  
Milling Cutters  
Reamers  
Standard Taper Shanks  
Drilling and Boring Tools  
Heat-Treatment of Steels  
S.A.E. Standard Steels  
Selection of Steels for Tools  
Hardness Testing  
Iron and Steel Manufacture  
Castings  
Forgings  
Standard Tolerance for Forgings  
Cement and Concrete  
Welding  
Soldering and Brazing  
Coloring Metals  
Motor Drives for Machine Tools  
Motor Characteristics  
Electric Motor Standards  
Weights of Materials and Other Properties  
Composition of Alloys  
Heat  
Properties of Air  
Hydraulics  
Pipe and Pipe Fittings  
Lutes and Cements  
Standards for Drawings  
Standard Abbreviations  
Weights and Measures  
Manufacturing Plant Appraisal  
Patents

# "Bible" of the Mechanical Industries

**Machinery's Handbook** is revised frequently to include important developments in engineering and shop standards, and in manufacturing practice. These changes in practice often make old handbooks unsafe to use. In recent years, many important new or revised standards have been established. The few items which follow represent some of the more recent developments found in the Twelfth Edition. Check this list against the handbook you are now using to see if all of these important standards are included.

**Standard Gage for Sheet Steel:** The Manufacturers' standard gage which conforms with present-day practice; it has replaced the original U. S. Standard Gage.

**Standard Thickness Tolerances:** Tolerances adopted by sheet steel manufacturers for both hot-rolled and cold-rolled sheets.

**Class 5 Screw Thread Fit:** Fit for threaded steel studs as approved for Federal services by the Government.

**American Standard Pipe Threads:** Standard as revised in 1942 by the American Standards Association. It includes taper threads, straight pipe threads for mechanical joints, and internal threads for couplings and lubrication fittings; also symbols recommended for different classes of standard pipe threads.

**Grinding Wheel Markings:** Standard adopted by the Grinding Wheel Manufacturers Association for indicating abrasive grain size, hardness or grade, structure or density, and bond or process.

**Gas Cylinder Threads:** American National Standard for gas cylinder valve outlet threads.

**Hose Connections:** American National Standard hose connections for welding and cutting torches.

**Gearmotor Speeds:** Standard speeds for motor reducers, as adopted by the National Electrical Manufacturers Association.

**SAE Steels:** General characteristics and present Standard with both old and revised composition numbers; also general applications recommended for SAE steels with 270 typical uses arranged in tabulated form and in alphabetical order.

**Jacobs Tapers:** Present standard for Jacobs tapers and threads for drill chucks and spindles.

**Gage Tolerances:** The American Standard Thread Gage and Plain Gage Tolerances.

**Translating Threads:** American Standard, including 10-degree modified square thread, general-purpose Acme thread, and the 29-degree and 60-degree stub threads.

**Bar Stock Tolerances:** Permissible variations in sizes of cold-finished and hot-rolled bars.

**Ball Bearings:** Dimensions of SAE and American Standard ball bearings.

**Casing Threads:** American Petroleum Institute Standard as revised in 1942.

**American Standard Reamers:** It includes hand reamers, rose reamers, chucking reamers, fluted chucking reamers, shell reamers and arbors, center reamers and taper reamers.

## Can You Answer These Questions?

*These sample questions suggest in a general way the practical up-to-date character of MACHINERY'S HANDBOOK*

How many series of pitches are included in the Aeronautical Screw-thread Series—1942?

Is there an American Standard for (1) Acme threads? (2) 29-degree stub threads? (3) 60-degree stub threads?

Why were splines of involute form adopted as the American Standard for splined shafts and fittings?

What is the difference between a commercial ground thread tap and a precision ground thread tap?

Can you explain the meaning of the following American Standard marks or symbols for identifying threads on taps? NC; NF; N; NS; NH; NPT; NPS; NPSG; V.

How many sizes of dial indicators are included in the present commercial standard?

What general classes of steels are adapted to flame-hardening?

What bearing metals would you use (a) for high resistance to fatigue? (b) for resistance to corrosion? (c) for non-scoring properties?

What range of drill diameters is covered by the American Standard for Straight Shank Twist Drills and how are the sizes designated?

If only parts or sections of a low-carbon steel part are to be hardened, is it practicable to use an activated liquid salt bath?

Under average conditions, what is the maximum ratio for silent chain drives?

When are magnesium-base die-casting alloys used?

What temperatures usually are employed for carburizing steels, and is water or oil generally used as a cooling medium?

What non-ferrous alloy (a) offers high resistance to salt water and is readily formed and welded? (b) combines excellent resistance to salt water with good physical properties?

Is the power-transmitting capacity of a chain drive affected decidedly by the number of teeth on the smaller sprocket?

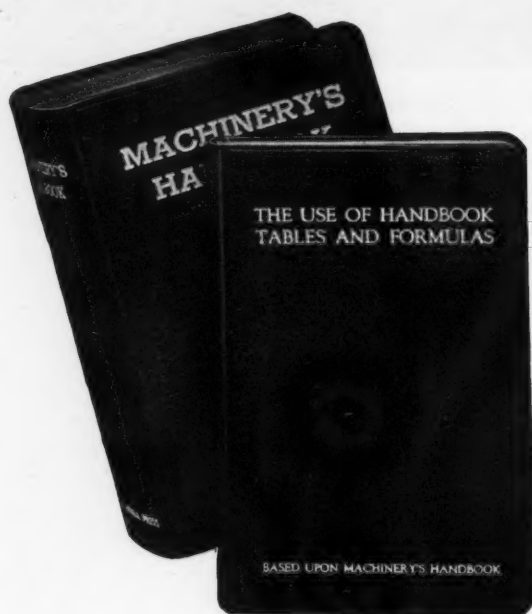
### Use of MACHINERY'S HANDBOOK in Engineering and Vocational Schools

An engineering handbook is the *one book* that all engineers, machine designers and skilled mechanics must use. Then why not use such a book in conjunction with engineering and shop-training courses? This plan *has* been adopted in many engineering and vocational schools. Instruction

in the use of MACHINERY'S Handbook is equivalent to bringing practical working conditions right into the classroom. Note, also, that MACHINERY'S Handbook has a supplementary instruction book expressly for use in technical schools. It shows how to use a handbook effectively.

(See next page)





## THE USE OF HANDBOOK TABLES AND FORMULAS

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MACHINERY'S HANDBOOK which  
Shows You How to Get the Most  
Out of Your HANDBOOK**

This companion book, which costs only \$1, serves three purposes: It throws the spotlight on a lot of essential time-saving tables, rules and general information in MACHINERY'S Handbook that the ordinary user never discovers.

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Geometrical Propositions and Constructions

Functions of Angles and Use of Tables

Solution of Right Angle Triangles

Solution of Oblique Triangles

Logarithms of Trigonometrical Functions

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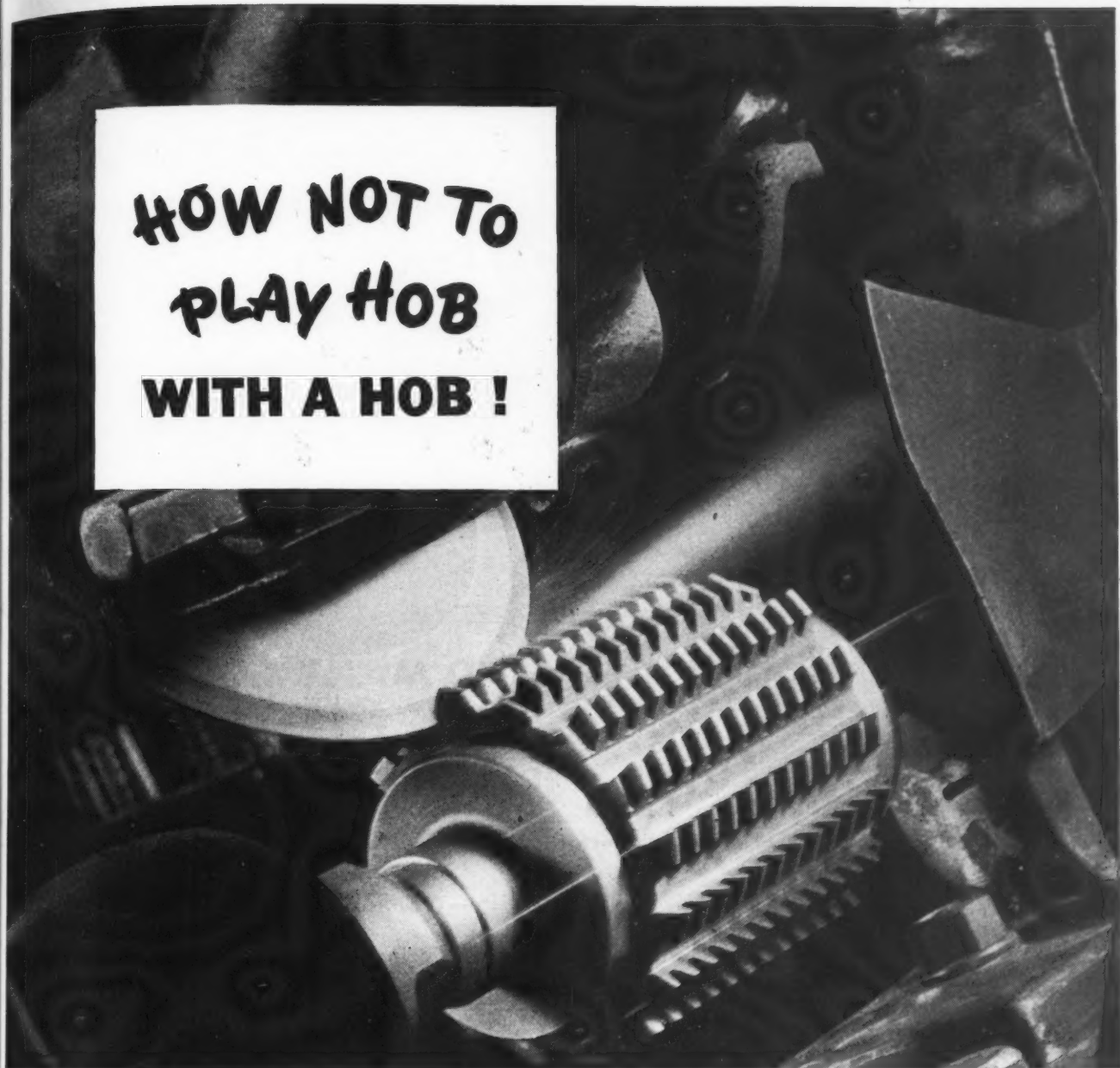
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# HOW NOT TO PLAY HOB WITH A HOB!



ONE of the best ways not to play hob with a hob is to be sure of your grinding wheel and this applies to any piece of tool room grinding. But if you want to get the best results, be sure you have a free, cool-cutting wheel that holds its shape like the "Aloxite" AA Wheel by Carborundum.

There have been a lot of new techniques developed during the last few years. New techniques in centerless grinding. New methods of cylindrical grinding. New ways to deburr, finish and polish metal. All of them have contributed to the progress of grinding. The man who knows all the angles is your Carborundum Sales

Representative. Let him survey your requirements. Perhaps he can help you do even a better job. Just consult nearest distributor or The Carborundum Company, Niagara Falls, N. Y.

**CARBORUNDUM**  
ABRASIVE PRODUCTS



Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, St. Louis, Cincinnati, Grand Rapids

## Grinding Wheels by **CARBORUNDUM**

(Carborundum and Aloxite are registered trade marks of and indicate manufacture by The Carborundum Company)

NO. 85 FACE GRINDER



**It takes  
many swallows  
to make a summer**

**AND MANY GOOD POINTS  
TO MAKE A  
REALLY FINE MACHINE**

**If interested in Surface Machining, it will pay you to note these features**

**FLAT SURFACES  
PRODUCED  
BY FACE GRINDING  
FASTER  
MORE ACCURATELY  
THAN BY OTHER  
METHODS**



**USED FOR:  
GUIDE BARS  
LOCOMOTIVE PARTS  
SHEAR KNIVES  
FORGING DIES  
ALL FLAT SURFACES**

**Hydraulic Operation**—Table travel, 120 ft. per minute; smooth, shockproof reversal.

**Bridgeport Sectional Grinding Wheel**—For maximum stock removal and fast, cool cutting. Wheel design brings coolant into cutting edges.

**Central Control**—All operating controls at fingertips of operator.

**Bridgeport Timken Spindle**—A proven design making for rigidity and accuracy.

**Pressure Lubrication** of ways and bearings with oil filter.

**Power**—Ample for heaviest requirements yet under instant control.

**Safety in Unloading**—Depressing a foot treadle clears table of operating dogs for safe unloading.

**Auxiliary Controls**—Hand reversal for instant table reverse. Spindle brake for stopping the wheel quickly.

**Extreme Rigidity** due to proper designing, with reserve material where stability is needed.

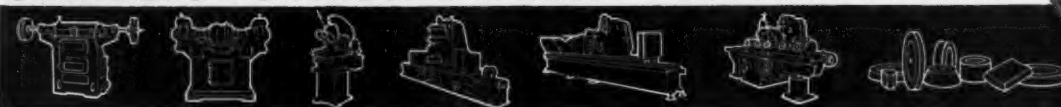
**Ample Coolant**—System includes two nozzles, fully adjustable, also flushing hose. Large coolant reservoir.

Further details on request.

**THE BRIDGEPORT SAFETY EMERY WHEEL CO., BRIDGEPORT, CONN., U. S. A.**

**Bridgeport**

**GRINDERS • GRINDING WHEELS • BUFFING LATHES**





*For Precision Work, with Speed*

## **-BOEING USES ABRASIVE SURFACE GRINDERS**

For giving fine finishes to the most accurate type of Airplane work, the Boeing Aircraft Company uses ABRASIVE Surface Grinders like the No. 3B Automatic photographed in their plant (below). The fast automatic feed makes this model a real production tool—and its ruggedness, sustained precision and wide adaptability are typical of the design features that have earned ABRASIVE Grinders their high reputation in tool-room and production work in Aircraft and other busy war plants all over the country.

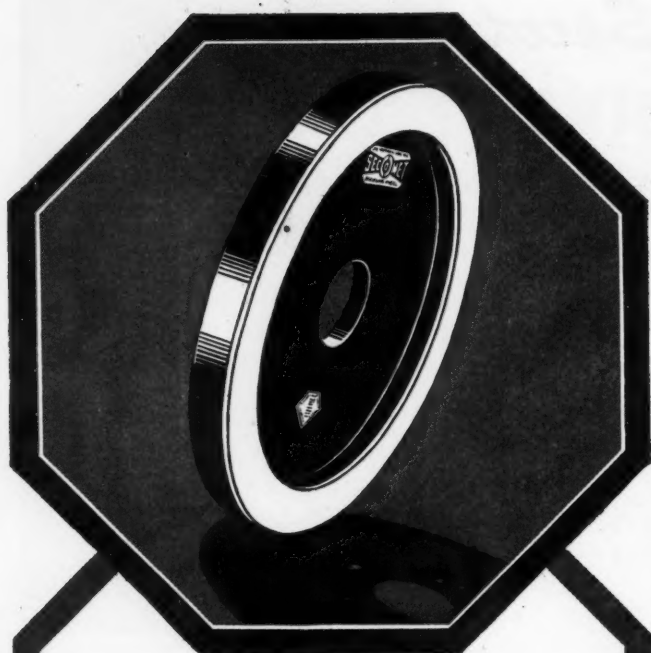


### **ABRASIVE MACHINE TOOL CO.**

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## SECOMET DIAMOND WHEELS

*Resinoid-bonded for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.*

*Metal-bonded for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.*

*Made in all standard types and diameters, in diamond concentrations to suit your requirements.*

*Catalog on request.*

**J. K. SMIT & SONS**  
157 Chambers St., New York 7, N.Y. 6400 Tireman Ave., Detroit 4, Mich.



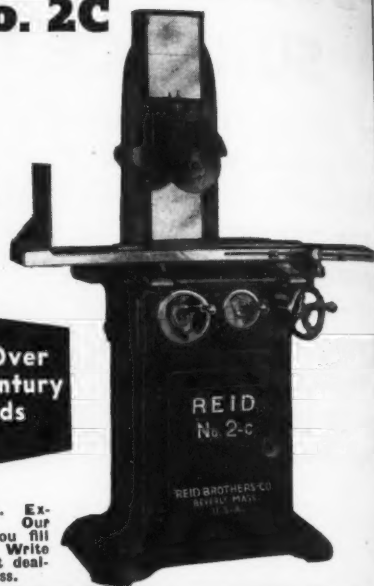
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## REID Hand Feed Surface Grinder No. 2C

Equipped with  
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Product for Over  
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## LEACH External Grinder

PRICE

**\$875.00**

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Grinds Work  
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# MORE SURFACE GRINDING

## GRINDING TIME REDUCED to 15% of Former Standard!

The proof piles up—through actual War Production Test Runs in busy plants . . . and Cortland Chucks and Segments are winning with outstanding performance.

For instance: A Production Test on a Blanchard No. 18 Vertical Surface Grinder by a manufacturer of filing machines and band saws. Wheel speed 705 R.P.M.

**WORK:** Saw tables for Vertical Band Saw Machines—close grained gray iron, not machined before grinding; 547.49 sq. in. top side; 1 piece per table load.

Here are the amazing Production Test facts—showing how Cortland Chucks and *Diagonal Shearing* Segments beat another brand by more than 6 to 1 in grinding performance.



Detail	CORTLAND Chuck and Segments	Competitive Brand of Sected Cylinder
Cubic inches of stock removed per inch in height of segments	418.81	38.12
Ampere readings	50	75 to 100
Dressings necessary	None	1
Work heat?	No	No
Grinding time	79 secs.	528 secs.

In addition to the great saving in grinding time, 6½ times more stock was removed by Cortland Chuck and Segments per unit height of abrasive.

Why not find out how Cortland Chucks and *Diagonal Shearing* Segments can increase the quality and quantity of your grinding output? Write for latest illustrated bulletin giving complete story of Cortland performance.

**CORTLAND GRINDING WHEELS CORP.**  
8 Cortland Street      Chester, Massachusetts

## Diagonal Shearing with Varying Contact Means Better Surface Grinding



A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

# CORTLAND

*Chucks and Segments*



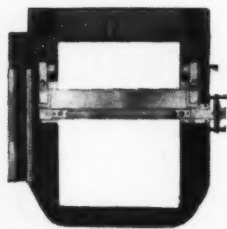
# **PEERLESS Saws** **SAE 1050 Billets at 7 sq. in.** **and More per Minute!**



14" Peerless Hydra-Cut in Forge Shop of Oil City Brass Works, Beaumont, Texas.

Precision sawing at higher speeds, with longer blade life and no surface hardening, results from the use of Peerless Hydra-Cut Metal Sawing Machines. Taking as little as 1/16" of material for the cut, Peerless gives you more usable parts per billet, bar or tube. The blade is good for 2,000 sq. in. As little as .005 need be allowed for finishing.

Even when cutting tubing or pipe, there's no hogging, less waste, less blade wear. This smooth, vibrationless sawing at higher speeds is due to the massive Four-Sided Saw-Frame that is a patented Peerless feature. Straight cuts are assured. No run-outs! It pays to lay out your work for a Peerless Hydra-Cut and relieve the load on higher priced machines. Mail the coupon for full details.



## **Only PEERLESS Has** **The FOUR-SIDED** **SAW-FRAME**

Massive Four-Sided Saw-Frame surrounds blade and the work, permitting bearings above and below Saw

Blade. Saw-Frame reciprocates on ground ways. Backing-plate permits extremely heavy feed pressure on cutting stroke without bowing, also assures positive clearance of blade on return stroke. Heavy arch supports all frame and houses dual feed cylinders.



Dept. M-844

- ☐ Mail catalog on Hydra-Cut Saw for High Production Cutting
- ☐ Mail catalog covering Vertical Type used for Die Block Work
- ☐ Mail catalog on Mechanical Type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company \_\_\_\_\_

Individual \_\_\_\_\_

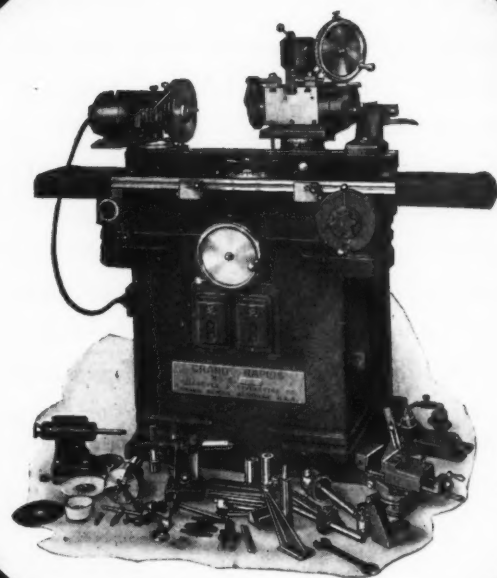
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# **GRAND RAPIDS** **No. 60**

## **UNIVERSAL** **Cutter-Tool** **GRINDER**



## *Features*

Cabinet Base Construction — Ball Bearing Table — Hardened and Ground Ways — Fixed Table Height — Cross Movement on Column enables operator to stand close to Machine at all times — Convenient Location of all Controls — All Wheel Shafts mounted on Grease-sealed Ball Bearings — One Shot Lubrication — Provision for Built-in Dust Collector.

*Full Description*  
**IN BULLETIN 10-1-43**

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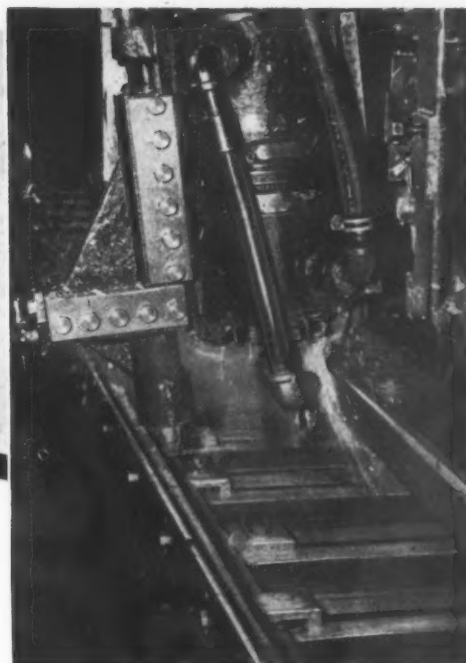
**GALLMEYER &**  
**LIVINGSTON CO.**

**305 Straight Ave., S.W., Grand Rapids 4, Mich.**

# QUICK FACTS

## About High-Speed Milling For Future-Minded Manufacturers

New products and new materials require new methods and new machines. Lower costs and faster production will be yours by methods such as now made possible by Onsrud high speed milling machines. Redesigned types of this equipment as well as new types, now in various stages of development, will bring economies equal to the full potential of the metals themselves. As you plan your production for the future, remember these five facts regarding non-ferrous metal milling.



### FACT No. 1

The light metals—aluminum, magnesium and their alloys—have cutting characteristics that make high speed milling not only feasible but desirable.

### FACT No. 2

These metals, with almost limitless applications, will likely attain the status of a plentiful, low-cost basic industrial material.

### FACT No. 3

Production records and job experience—notably those obtained in making aircraft parts—prove that high speed milling lowers production costs *drastically*. There is no sacrifice of quality or accuracy in achieving production rates not possible with older methods.

### FACT No. 4

To take full advantage of the possibilities of high speed milling, it is not enough to increase cutter RPM of conventional machines. The light metals have been called the "metals of motion." Equipment for their machining must possess high speed feed traverse and unusual flexibility.

### FACT No. 5

As pioneer builders of high speed, high production machines, Onsrud Machine Works, Inc., has the necessary background of experience and the intimate knowledge of the subject to build such machines. Look to Onsrud in the future for developments in high speed milling equipment for the light metals and their alloys.

### ONSRUD MACHINE WORKS, INC.

3940 Palmer Street, Chicago 47, Illinois

Manufacturers of Routers, Shapers, Automatic Contour Milling  
Machines and Related Portable Tools for Aircraft Production



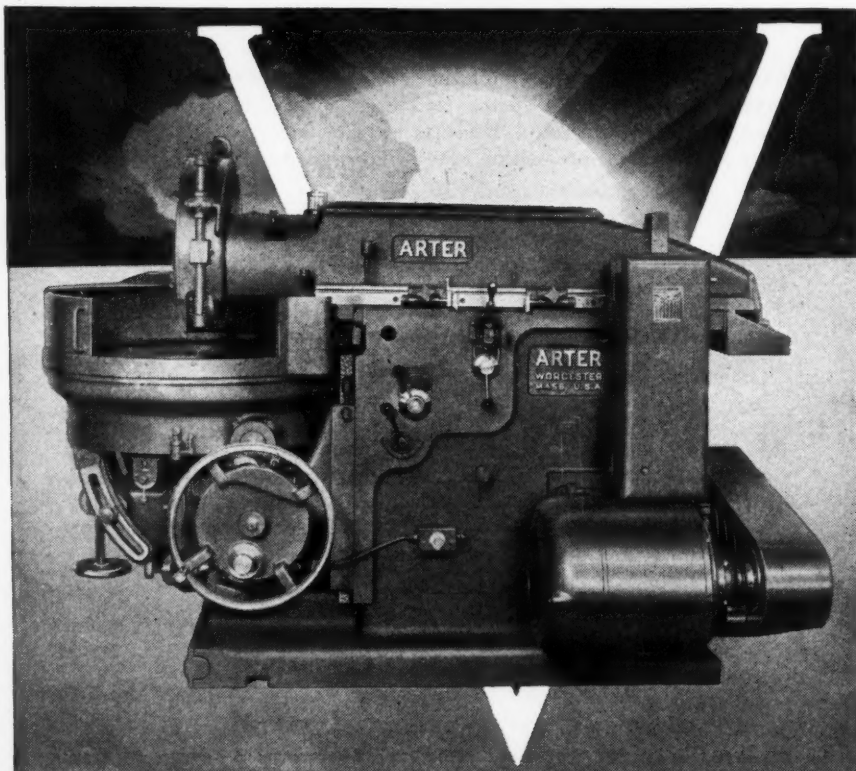
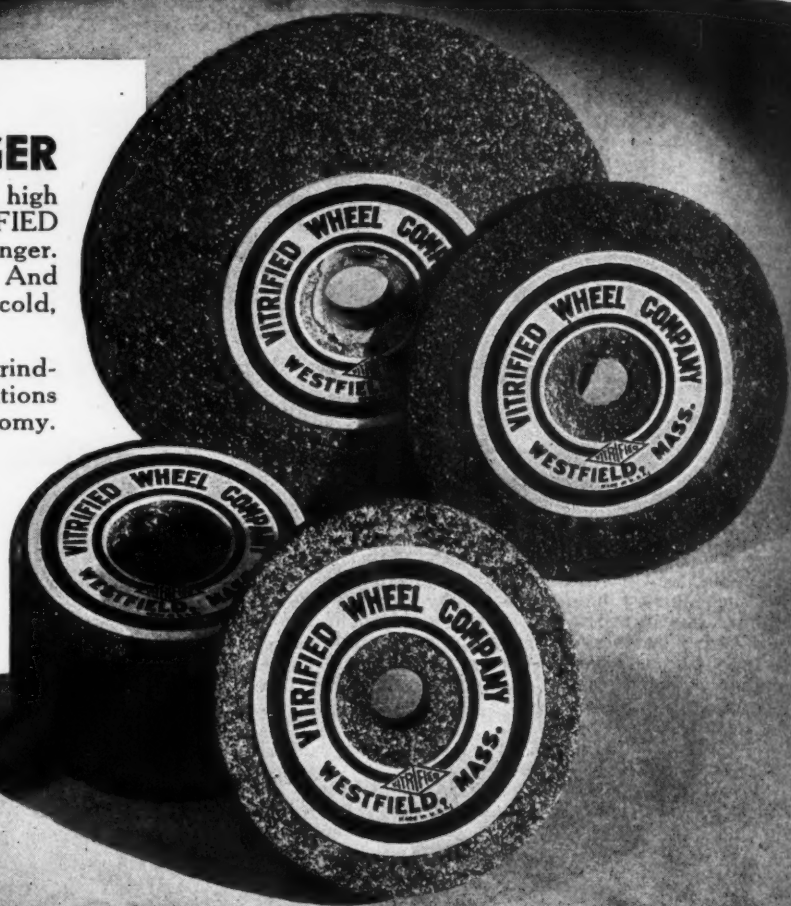
MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

## THEY STAY TRUER . . . LONGER

High quality grinding becomes high economy grinding with VITRIFIED WHEELS. They stay truer—longer. They will not gum or glaze. And they are not affected by heat, cold, oils, or acids.

Let our engineers study your grinding jobs and make recommendations for greater service and economy. No obligations, of course.

**VITRIFIED  
WHEEL CO.**  
WESTFIELD, MASS.



Versatility is a well recognized quality in Arter Rotary Surface Grinders and versatility is highly important in production changes that these changing times are sure to bring.

Progressively developed, precisely engineered, Arters are worthy of the highest type of American production methods which are today winning the war. For today's demands and for tomorrow's new problems—Arters.

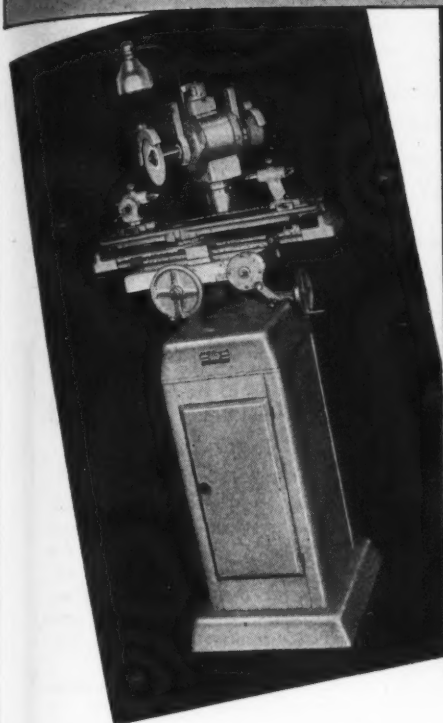
# ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

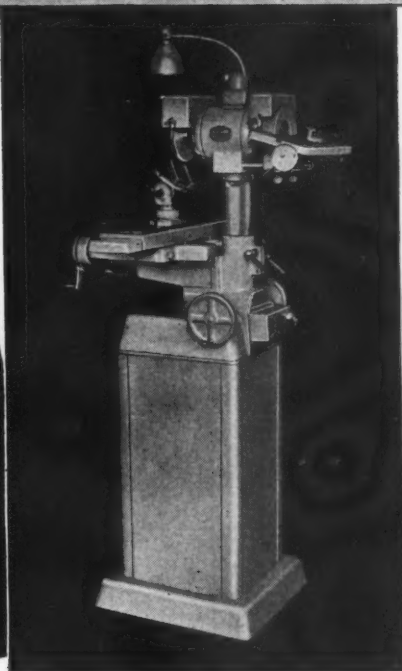




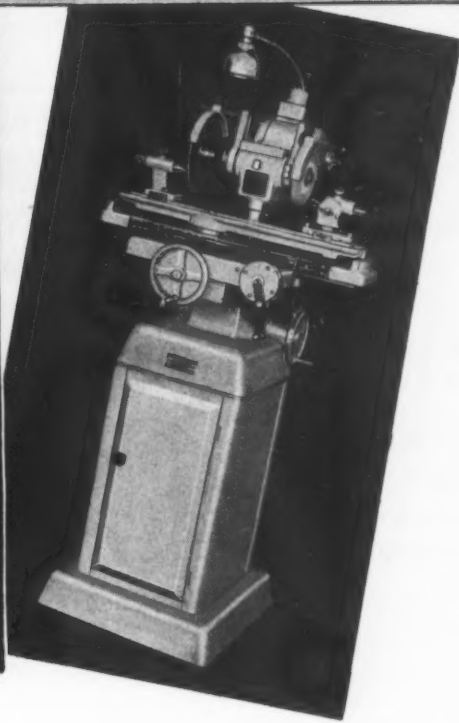
# UNIVERSAL TOOL GRINDERS



The Knock-Out Universal Tool Grinder is built for twenty four hour a day service on production or in tool room maintenance work. Model B600 is made to accommodate wet or dry grinding jobs. Model B602 is built for dry grinding jobs only. Specifications: Swing over table 6¼" (8¼" with raising blocks); distance between centers 17"; working surface of table 2½" x 22½".



Model B604 Universal Carbide Tool Grinder is built for fast and accurate grinding of conventional single point carbide tipped tools. This machine can be purchased complete to accommodate all grinding necessary on carbide tools, or as a Chip Breaker Grinder only (Model B603). It is equipped with the Universal Work Holding Fixture which can be readily re-set for repeat grinding of chip breakers.



The Model B660 Universal Tool Grinder with multiple speed head is a new addition to the Knock-Out family. With the "Speed Head" the operator can select the proper speed for the job. Nine speeds are available ranging from 1,000 to 11,000 RPM. Standard equipment includes nine assorted grinding wheels, four assorted pulleys, and four drive belts.



**Knock-Out Grinders** are truly leaders in their field. These machines offer the operator versatility of operation, speed in making set-ups, and economical grinding on both production and maintenance work. A large number of fixtures are available, any one of which can be applied to any K-O grinder without alteration to the machine.

Fine finish production grinding or keen edged cutting tools—both yours with K-O Grinders. Write for Bulletin No. 30-84 and specify grinder model on which you desire more information.



**K. O. LEE COMPANY**  
ABERDEEN SOUTH DAKOTA



## ★ PAYS FOR ITSELF IN TOOLS AND TIME SAVED!

Use the Greenfield Tool and Cutter Grinder for precision work of all kinds. It will pay for itself many times over in tools and time saved! Besides tool and cutter grinding of all kinds (drills, taps, cutters, reamers, hobs, etc.)—the No. 4 Grinder can be equipped for cylindrical grinding on work

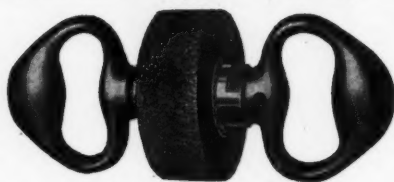
up to 3" dia. by 12" long, and internal grinding on work up to 4" outside dia. by 5" long. Extra sturdy construction throughout. Controls accurately graduated for quick precision settings. **WRITE FOR BULLETIN TODAY.**

### GREENFIELD TOOL AND CUTTER GRINDER

PRODUCTION MACHINE CO., Greenfield, Mass.

## CRACKERJACK!

The Newest  
Ball-Bearing  
Grinding Wheel  
Dresser



Made in single handle, double handle and tool post types, Desmond "Crackerjack" is the latest addition to our complete line of wheel truing equipment. Write for our catalog showing all types of mechanical, abrasive and diamond dressers and choose *exactly* the right tool to fit your needs.

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## BALDOR Special GRINDER for CARBIDE TOOLS

Precision-built for accurately and quickly sharpening Carbide Tools. Sturdy ½ h.p. ball-bearing, reversible motor; 6" Silicon Carbide wheels and large adjustable tool - rest tables..... **\$95**

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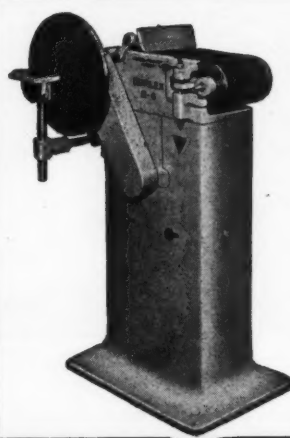
**DIAMOND POINTED TOOLS  
FOR TRUING AND DRESSING ABRASIVE WHEELS**

Mountings furnished in all forms at no extra charge—for your specifications.

Tool No.	Size of Diamond	Suggested Wheel Size	Price Per Tool
1	0.25	4"x 1/2"	\$ 4.00
2	0.35	6"x 1/2"	6.00
3	0.50	8"x 1"	9.00
4	0.60	10"x 1"	11.00
5	0.75	12"x 1"	14.00
6	1.00	14"x 1 1/2"	22.00
7	1.25	16"x 1 1/2"	27.50
8	1.50	18"x 2"	37.00
9	1.75	20"x 2"	48.00
10	2.00	24"x 3"	56.00
11	2.50	24"x 3"	70.00
12	3.00	24"x 4"	88.00

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HIGH SPEED  
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet wartime production standards—quickly, economically!

Other styles and sizes in New Booklet on Finishing. Write Today.

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96 Warren St., New York 7, N.Y.

Superbly Accurate, Speedy  
and Convenient

### WARDWELL No. 57T Automatic Circular Metal Saw Grinder

Fully automatic and precise sharpening of slitting and screw slotting Saws and Milling Cutters. Capacity includes saws up to 8" in dia., in range up to 3 3/4" thick. Automatic indexing and accuracy within ±.001" of exact diameter of entire lot. This machine pays for itself many times over—a "must" for Economy in high production shops. Illustrated Bulletin gives all details.

**THE WARDWELL MFG. CO.**  
3168 Fulton Rd. CLEVELAND, OHIO



### The BARNES Motor Driven Precision Cutter Grinding Machine

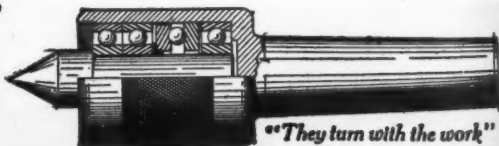
For Precision Grinding Formed Milling Cutters  
Used in the Manufacture of Rifles, Pistols, etc.

Write for bulletin giving complete description.

**GENERAL MACHINERY CORPORATION**  
140 Federal St., BOSTON, MASS. Telephone Liberty 4826



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"They turn with the work"

**MODERN MACHINE CORP., 323 Berry St., Brooklyn, N.Y.**

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The production lines of American Industry are behind the battle lines of the United Nations. Batteries of Niagara Presses and Shears are speeding up production of America's *SUPERFORTRESS* — Fastest of Bombers.

High output, convenient operation, reliability that reduces shut-downs to a minimum are performance factors resulting from Niagara design.

Niagara Presses and Shears are built in a complete range of well graduated sizes.

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**NIAGARA MACHINE &  
TOOL WORKS**

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District Offices: Cleveland, Detroit, New York



**NIAGARA**



# CLEVELAND

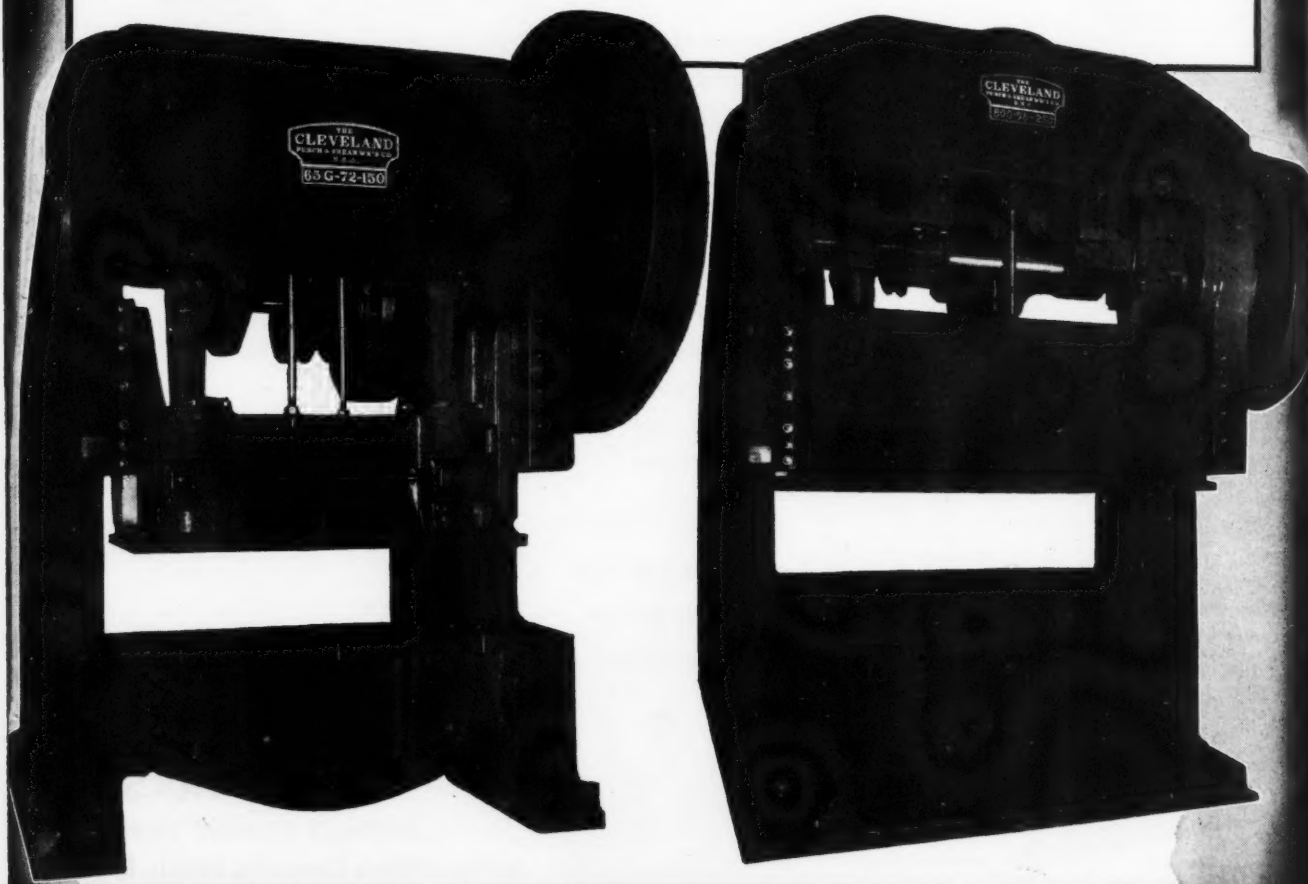
## *Cleveland Open Back Gap Presses*

CLEVELAND Open Back Gap Presses are used extensively for punching, shearing, bending and forming operations and are especially recommended for the convenience which the gap in the housings affords for the handling of large or irregular shapes and for feeding material right and left across the dies.

The illustration on the left shows a 60-G-72 Double Gap Press which has a capacity of 150 tons. The Press is single geared, single end drive and is equipped with an electrically controlled hydraulic clutch. The slide is counterbalanced by air and the flywheel is provided with a separate air brake to bring it to a quick stop. The Press has a bed area of 24" x 72", stroke of 10" and operates at 25 strokes per minute.

The illustration on the right shows an 80-G-96 Double Crank Gap Press having a flush front which permits the use of a table to suit various operating conditions. This Press has a capacity of 250 tons and is equipped with an electrically controlled hydraulically operated friction clutch and brake. The slide is air counterbalanced and the flywheel is provided with a separate air brake to bring it to a quick stop. The face of the slide measures 22" x 100" and the Press which has a 6" stroke, operates at 18 strokes per minute.

Cleveland Open Back Gap Presses can be furnished in either single or double crank and in sizes and capacities to suit requirements.



**THE CLEVELAND PUNCH & SHEAR WORKS COMPANY**

*Cleveland 14, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

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WILL BE GLAD TO HELP YOU  
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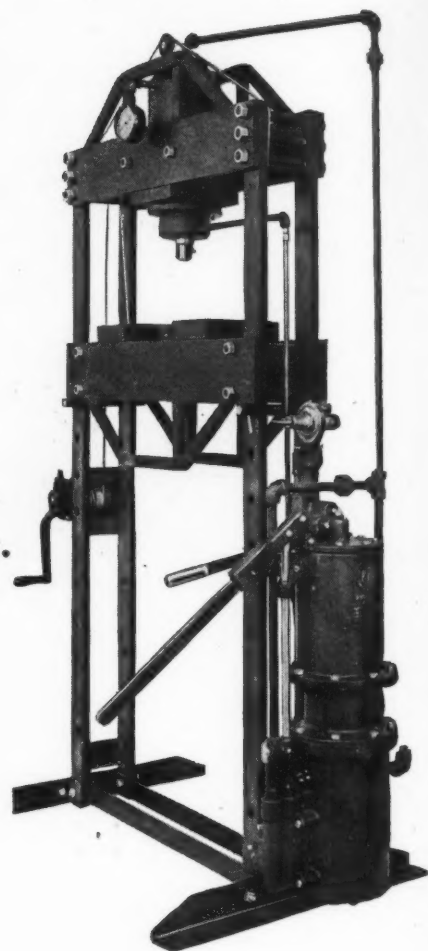
570 LEXINGTON AVENUE • NEW YORK • N. Y.

# THIS *Low-Cost* KRW

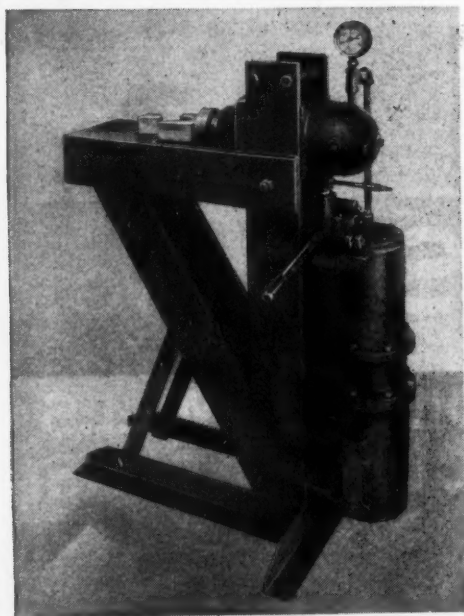
**VARIOUSLY ADAPTED...EQUIPPED WITH THE PATENTED KRW SPEEDI-BOOSTER...AND USING INEXPENSIVE DIES...IT DUPLICATES THE WORK OF HEAVY, HIGH-COST PRESSES AND BENDING MACHINES**

● Even to the experienced production man, some of the work being turned out on various adaptations of the KRW Hydraulic Arbor Press is "eye opening." Literally by the thousands, KRW presses...in all types of war work...are doing the unusual and doing it at *lower cost*. This is especially true where short-run items are wanted fast.

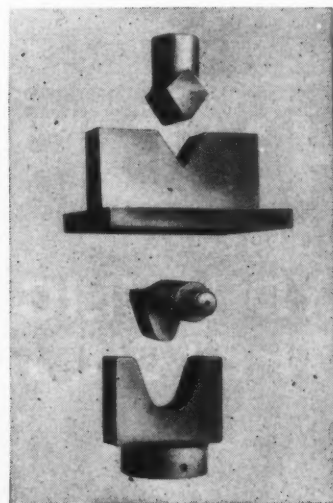
The **SPEED FACTOR** in KRW Press operation results from the new patented **SPEEDI-BOOSTER** with instant fingertip control over ram head movement. Using low-cost dies...made largely of ingenuity and welded or machined scrap steel...any 25, 50, 60 or 75-Ton KRW Press can produce a wide variety of bending, forming and pressing. Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke...this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation. We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin. K. R. WILSON, 10 Lock Street, Buffalo 2, New York.



## THIS MACHINE...MAKES THIS...WITH THESE SIMPLE DIES



This specially adapted version of the Standard KRW 25-Ton Press turns out these 5/8 CRS swivels in two operations, at high speed. Dies illustrated were welded and machined from scrap steel. Top set shown form the two end bends as the first operation. Lower set, close the loop in final operation. Working position on the press is handy...worker fatigue is held to a minimum.



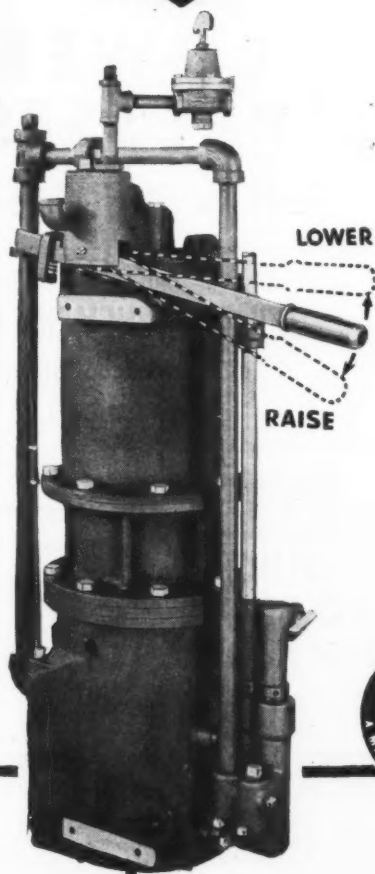


# **PRESS** will give you **ROUND-THE-CLOCK** **PRODUCTION AT...** *Lowest cost*



## **The Reason Why KRW Presses Are Fast and Accurate**

The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.



### **AVAILABLE TONNAGE PRESSURES 25 - 50 - 60 TON PRESSES**

AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
	2" Oil Cylinder	1 3/4" Oil Cylinder	2" Oil Cylinder	1 3/4" Oil Cylinder
100 TO 200 POUNDS	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

### **75 TON PRESS**

AIR PRESSURE	9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1 3/4" Oil Cylinder
	25 to 51 Tons	33 to 68 Tons

Write Today for the  
KRW HYDRAULIC PRESS CATALOG



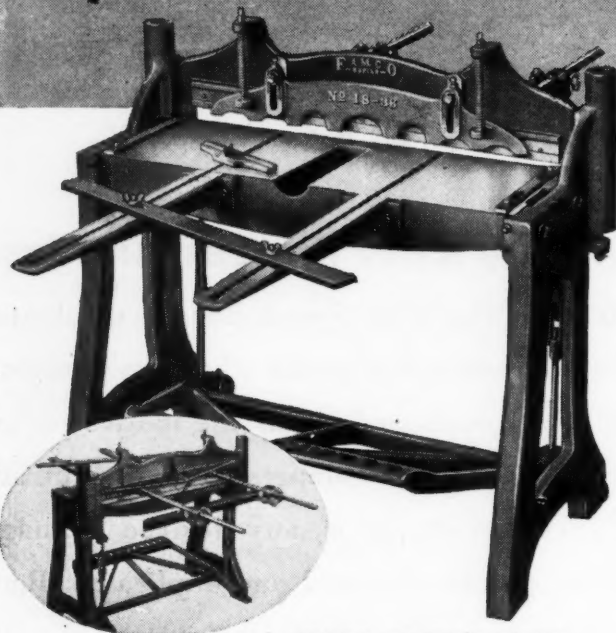
# **K. R. WILSON**

10 LOCK ST., BUFFALO 2, N. Y.

# famco

## Announces

### A BRAND NEW LINE OF FOOT-POWERED SQUARING SHEARS



#### MADE IN FIVE SIZES

Famco proudly presents a new, highly efficient, foot-powered squaring shear . . . the result of many months of designing, engineering and testing . . . available in 22", 30", 36", 42" and 52" cutting widths.

● If you need a squaring shear, it will pay you to investigate the latest thing on the market. Famco has developed a new, low cost, foot-operated (motorless) machine that's extremely powerful . . . will cut up to 18 gauge mild steel.

This machine is ruggedly built of semi-steel, accurately machined. The cross-head is reinforced with a steel tie rod for proper knife alignment and accurate shearing. Compressing springs are encased to practically eliminate their breakage. Knives have tool steel cutting edges.

Fast, accurate depth setting is accomplished with back gauges moved on heavy support rods by means of graduated racks and pinions. All models are equipped with front, back and side gauges. The "hold-down" attachment is furnished with the 36", 42" and 52" sizes.

● Write for information and prices on this inexpensive, efficient new line of shearing machines.

#### FAMCO MACHINE COMPANY

1300 EIGHTEENTH STREET • RACINE, WISCONSIN



Famco builds 32 models of bench and floor type arbor presses that deliver from ½ to 15 tons pressure.

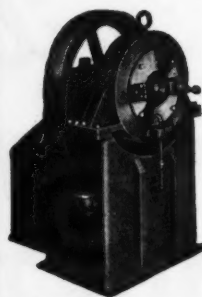
Famco Foot Presses are made in 10 sizes, for bench or stand mounting . . . save cost of power presses.



# famco

ARBOR PRESSES • FOOT PRESSES • SQUARING SHEARS

362—MACHINERY, August, 1944



## Swaging—What it is and *How* it is done on **TORRINGTON SWAGING MACHINES**

All explained in booklet—"The Torrington Swaging Machine"—Your copy mailed on request.

Examples of many possible operations by the Rotary Swaging Method:—

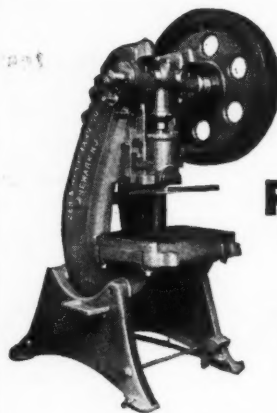
- |                              |                                    |
|------------------------------|------------------------------------|
| 1 Point rods for drawing     | 8 Tap blanks                       |
| 2 Pointed rods and tubing    | 9 Banding Rotating Bands on shells |
| 3 Tapered rods and tubing    | 10 Meat hooks                      |
| 4 Acetylene torch tips       | 11 Refrigerator expansion bulbs    |
| 5 Curling iron tubes         | 12 Sizing and Reducing wire        |
| 6 Bonding Ferrules to cables |                                    |
| 7 Steel furniture legs       |                                    |

Present Owners of Torrington Swaging Machines are quoted promptly on request for prices for die renewals, etc.

### THE TORRINGTON CO.

55 Field Street

Torrington, Conn.



## POWER PRESSES

### Roll & Dial Feeds

### ZEH & HAHNEMANN CO.

182 Vanderpool Street

NEWARK, N. J.



### QUICK LOADING STOCK REELS

SINGLE  
INCLINABLE  
FOR COILED  
STRIP STOCK

DOUBLE  
SWIVEL  
FOR COILED  
STRIP STOCK

When feeding stock from coils to punch press or any other machine, the S & S Stock Reels make for speed and economy. Easy to load—no screws to loosen or tighten—dependable. Single Inclined Reel sets in any plane. Double Swivel Reel permits loading of one coil while other is reeling out stock . . . a "reel time-saver."

**S & S MACHINE WORKS,** 4541 W. LAKE ST. CHICAGO, ILLINOIS

Forming drawers from 16 gauge steel.

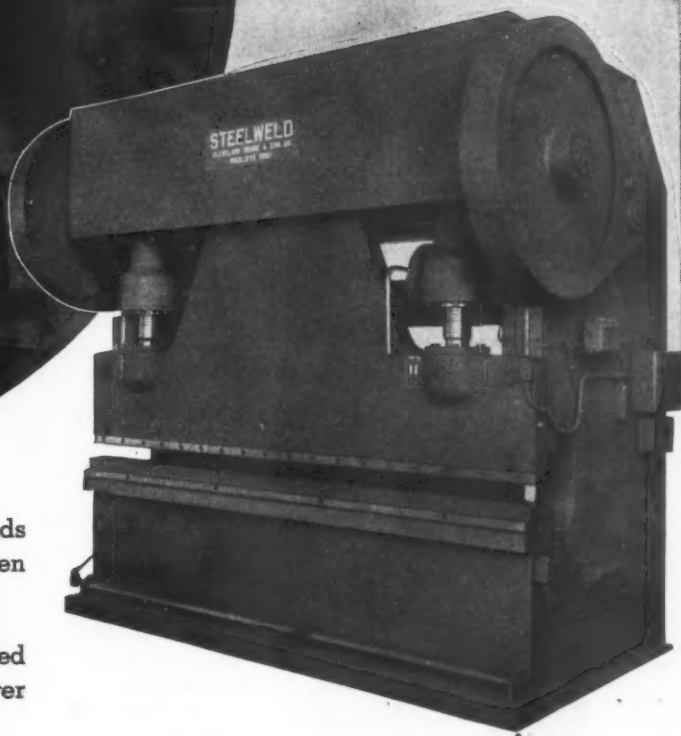
## Sharp Corners EASY ON STEELWELDS

For many jobs requiring straight, accurate bends with sharp corners, Cleveland Steelwelds have proven a means of speeding production and lowering costs.

Because of the deep bed and ram and the all-welded steel construction, Steelwelds provide the power required with practically negligible deflection.

Many press men feel Steelwelds have features that make them especially advantageous for this work. The ram stops quickly with little drift. Exact pressure desired is easily obtained. Clutch and brake are simple to adjust. Very little maintenance is required.

A great advantage of Steelwelds is that through use of quickly changed dies, punching, beading and many other operations are handled with equal dispatch.



Cleveland Steelwelds are available for plate of all gauges up to one inch and for lengths up to 20 feet.



### GET THIS BOOK!

CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

### THE CLEVELAND CRANE & ENGINEERING CO.

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WICKLIFFE, OHIO.

# CLEVELAND STEELWELD PRESSES

GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND



**STRONG FOR RUGGED  
WORK... RESPONSIVE  
TO SKILLED HANDS**



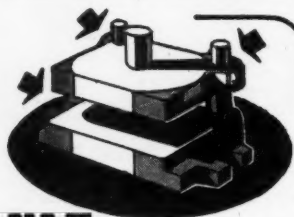
**CRIMPING AND  
BEADING MACHINE**

**SHEARS  
FOLDERS  
BRAKES  
FORMERS  
ROTARY  
MACHINES**

*for all*  
**SHEET-METAL  
FABRICATION**



**The Peck, Stow  
& Wilcox Company**  
Southington, Conn., U.S.A.  
*Since 1785*



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**PRECISION DIE SETS**

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**THEIR  
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Means Greater  
Accuracy  
In Your  
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Commercial Sets  
Danly  
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**DANLY**  
DIEMAKERS' SUPPLIES

**BETTER-MADE  
DIE SETS**

**46  
DIFFERENT  
STYLES**



**AT LOWER  
COST**

**OVER  
195,000  
SIZES**

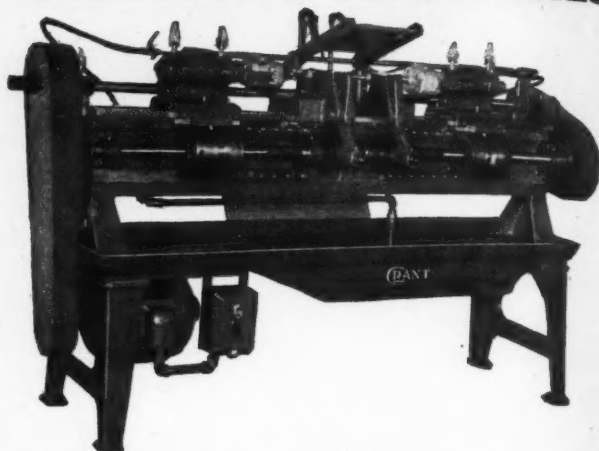
**Machined Steel**

**Semi-Steel**

*Send for Our New Catalog*

**E. A. BAUMBACH MFG. CO.**  
1810 South Kilbourn Ave. Chicago, Ill.

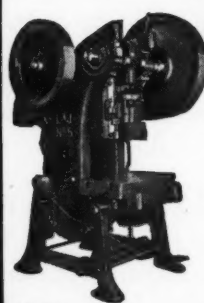
# GRANT<sup>DOUBLE END</sup> AUTOMATIC THREADING MACHINES



*War Equipment Manufacturers!*

GRANT Double End Automatic Machines are in universal use for tapping, external threading and reaming operations on various types of munitions. Capacities up to 3/4" diameter, 36" in length. Send samples or prints and get our detailed recommendations.

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**INCLINABLE  
POWER PUNCH  
PRESSES**

5 TO 75 TONS

**No. 5 BACK GEARED**

49 Ton Capacity  
45 Strokes per minute  
\*10 1/2" Die Space  
(Bed to slide, stroke down, adj. up)  
4" Standard Stroke  
6700 lbs. weight  
Also available in plain flywheel type  
\*No. 5 Special has 15 1/4" Die Space

*Write for Catalog.*

STANDARD  
SINCE  
1911

**L & J PRESS CORP.** *Elkhart, Ind.*  
1431 STERLING AVE.  
SUCCESSORS TO LOSMROUGH JORDAN TOOL & MACHINE



**GRAY TURRET HEAD  
METAL CUTTER OR NIBBLER**

**GRAY, Originator of First Practical Metal  
Cutter or Nibbler**

Most modern Nibbler for Template Cutting,  
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Aircraft Tubing, Sheet and Plate Shops.

**GRAY MACHINE CO., Box 596, PHILADELPHIA, PA.**



**PRESSES  
FEEDS  
AUTOMATIC EQUIPMENT**

**The V & O Press Company, Incorporated**  
HUDSON, NEW YORK

*Can you use a press...*  
**that saves time and  
 labor like this?**

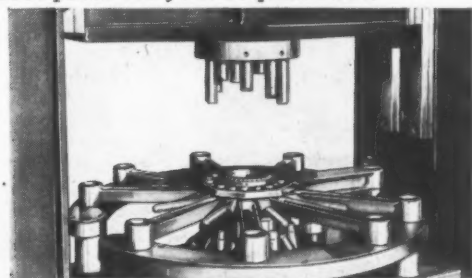


**This Verson Press and  
 1 man does a job in 2  
 minutes formerly done  
 by 2 men in 24 minutes**

Here is a real example of production and manpower efficiency. It is the result of Verson Press Engineering applied to a problem and solving it with the "right" press for the job.

This Verson Hydraulic Forcing Press forces out the wrist pins in aircraft engine connecting rod assemblies to speed their dismantling for inspection. The operator adjusts the rod assembly—starts the press and within a few seconds is able to remove the loose rods and detached pins—a complete operation in less than 2 minutes.

When you are considering a press—hydraulic or mechanical . . . up to 3000 tons capacity—talk it over with Verson and you will be sure to have every advantage possible; with the exact press for your requirement.



Connecting Rod Assembly in position on press

**Verson** TRADE MARK *Allsteel Presses*

What are your press problems? Whatever they may be Verson can help you solve them to your advantage. Ask to see a Verson Engineer and write for the new catalog E-44.

**VERSION ALLSTEEL PRESS CO.**

9309 South Kenwood Ave. • Chicago 19, Illinois

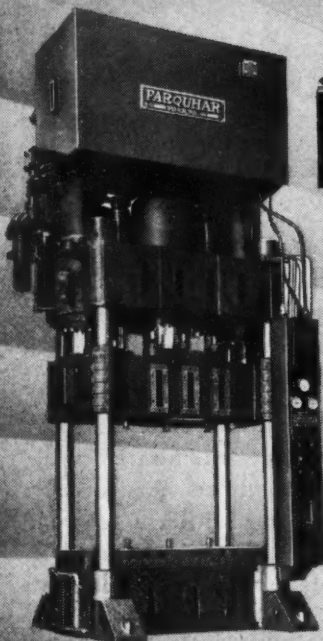
**POWER PRESSES • HYDRAULIC PRESSES • CLUTCHES  
 FORGING PRESSES • PRESS BRAKES • DIE CUSHIONS**

MACHINERY, August, 1944—365



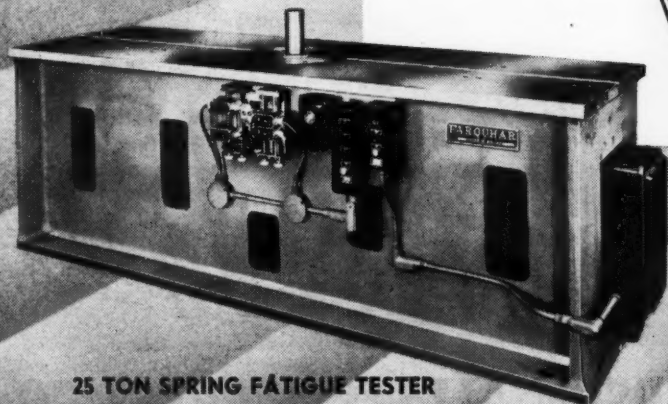
### 75 TON GENERAL PURPOSE PRESS

Capacity	75 tons
Clear between columns R. to L.	24"
Bed F. to B.	24"
Daylight	42"
Stroke	18"
Floor Space	5'-5" x 4'-10"
Overall Height	9'-10" App.
20 H.P. Motor	
Oilgear Pump	



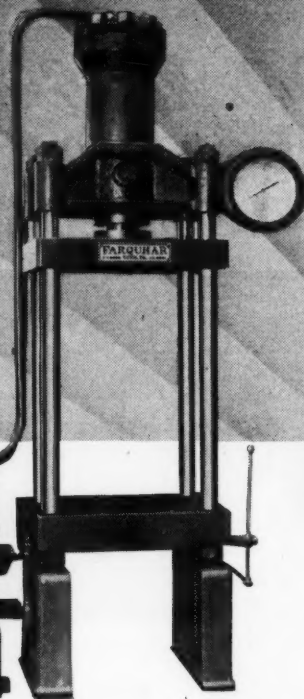
### 750 TON SETTING PRESS

Capacity	750 tons
Clear between columns L. to R.	72"
Bed F. to B.	42"
Daylight	64"
Stroke	36"
Top & Bottom Ejectors	
Floor Space	6'-6" x 10'-0"
Overall Height	21'-9"
125 H.P. Motor	



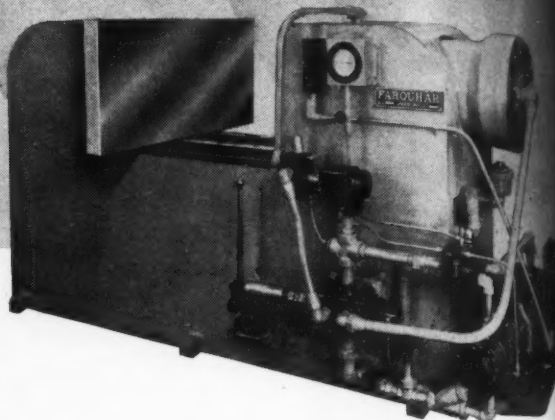
### 25 TON SPRING FATIGUE TESTER

Capacity	25 tons
Table	
L. to R.	8'-8"
F. to B.	2'-4 1/4"
Stroke	4"
Floor to Table	34"
Floor Space	6'-8" x 4'-8"
20 H.P. Motor	



### 100 TON HORIZONTAL GAP PRESS

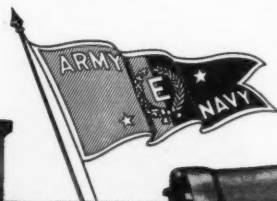
Capacity	100 tons
Gap	13 1/4"
Bed Size	22" x 4'-0"
Opening	22 1/4"
Stroke	22 1/4"
Floor to G. of Platen	40 1/4"
Floor Space	10'-0" x 4'-6"
Overall Height	5'-0"
10 H.P. Motor	



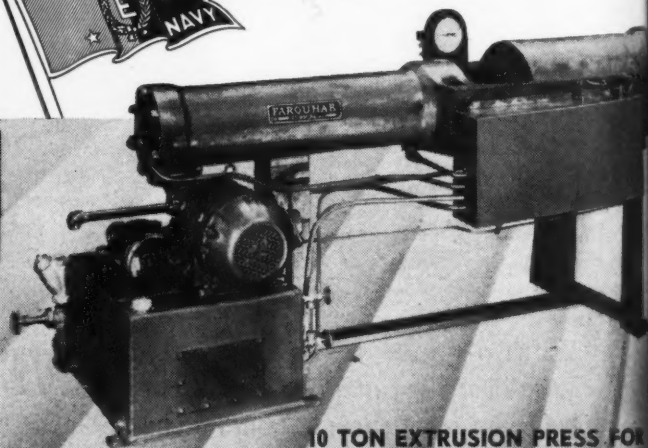
# Farquhar

## FOR EVERY HYDRAULIC PRESS

When your processes require self-contained hydraulic production presses, call on Farquhar for help. The units shown here are but a few of the types and sizes we have built for every industrial purpose. Ranging from 3 to 7,200 ton capacities, Farquhar Presses serve in such varied spots as food industry, metal working, ceramics, laminating, powder metallurgy, dehydration and many allied tasks. Our experienced engineers will be glad to consult and advise with you on any problem, old or new, that involves hydraulic production presses. Your query will receive prompt attention.



Awarded for Excellence in Quality  
and Quantity Production



### 10 TON EXTRUSION PRESS FOR SOFT MATERIALS

Capacity	10 tons
Material C. & L.	14" Dia. x 2'-0"
Stroke	
Floor to G. of Press	
Floor Space	6'-0" x 3'-0"
3 H.P. Motor	

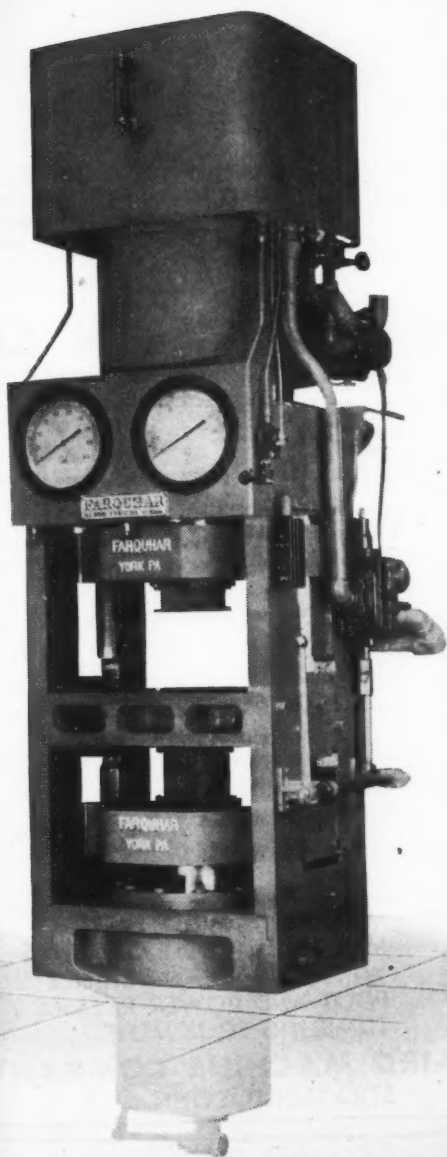


# Farquhar

## HYDRAULIC PRODUCTION PRESSES

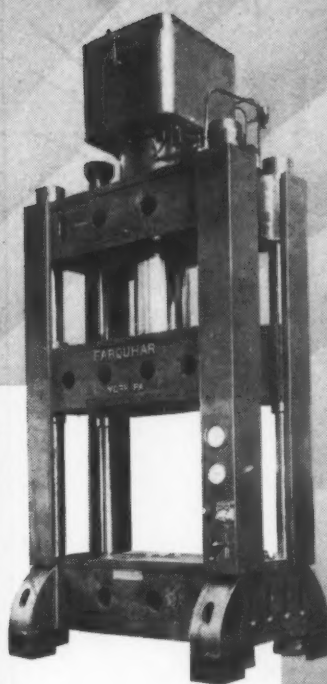


B. FARQUHAR COMPANY YORK, PA.



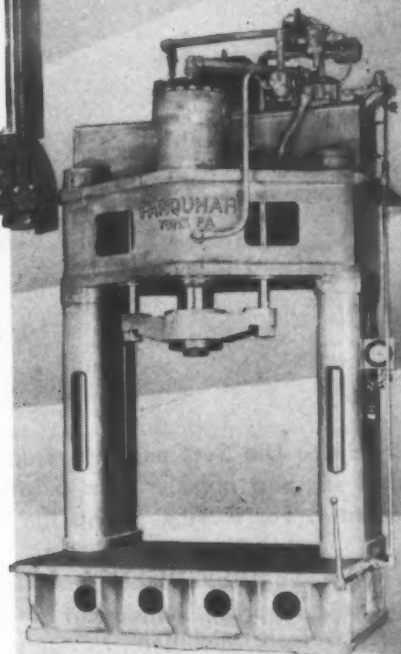
**225 TON BRICK PRESS**

Capacity	225 tons
Clear between housings, L. to R.	28"
Bed, F. to B.	24"
Mold Size	9" x 4 1/2" x 6"
Stroke of upper cylinder	12"
Stroke of lower cylinder	6"
Floor Space	3'-4" x 3'-7"
Overall Height	10'-3"
7 1/2 H.P. Motor	



**250 TON VERTICAL PRESS**

Capacity	250 tons
Clear between columns, L. to R.	62"
Bed, F. to B.	36"
Daylight	72"
Stroke	24"
Floor Space	7'-0" x 5'-2"
Overall Height	17'-0"
15 H.P. Motor	



**100 TON STRAIGHTENING PRESS**

Capacity	100 tons
Clear between housings	4'-4"
Bed, F. to B.	4'-7"
Daylight	4'-4"
Stroke	24"
Floor Space	7'-0" x 5'-3"
Overall Height	12'-0"
10 H.P. Motor	



**60 TON STEAM PLATEN PRESS**

Capacity	60 tons
Steam Plates	24" x 24"
No. of openings	1
Daylight	12"
Stroke	12"
Floor Space	8'-0" x 4'-6" x 5'-0"
7 1/2 H.P. Motor	



Producto Die Sets and Accessories can be assembled and shipped quickly from 5 strategic points in the country. For service 'phone the following:

#### ASSEMBLY PLANTS AND WAREHOUSES

Bridgeport, Connecticut	4-9481
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Philadelphia, Penn.	Radcliffe 1467
Dayton, Ohio	Taylor 5201

#### SPECIAL DIE SETS

Quick service on all Special Die Sets and Bolster Plates from Bridgeport and Detroit. Complete specifications in No. 9 Catalog.

- Use Producto Modern Machine Vises

  
*The*  
**PRODUCTO**  
**MACHINE COMPANY**

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**KEYSEATING**  
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**AT**  
**WARTIME**  
**SPEED!**

Plants engaged in war production are keeping Davis Keyseaters busy on a variety of jobs. The tilting table, high capacity, and quick set-up features make them extremely versatile, useful for many jobs in addition to keyseating. And the Davis broaching pull cut saves time on every job! Write for full details.

**DAVIS KEYSEATER CO.**

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*Francis*  
 EST. 1880.

**PRESSES** Hydraulic — Many Sizes  
 — Cold and Hot Plate —  
 Various Capacities, Pressures, Speeds, or  
 Methods of Operation and Control.

**ROLLER COATERS** For coating any sheet material with any liquid or semi-liquids.  
 Consult us. We may have just the machine... or can build it for you.

**CHAS. E. FRANCIS CO.**

Rushville, Indiana

*Machinery Manufacturers Since 1880*



**MULTIPLE SPINDLE LATHES**  
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**WIRE FORMING MACHINES**  
**FOOT AND POWER PRESSES**  
**TUMBLING EQUIPMENT**

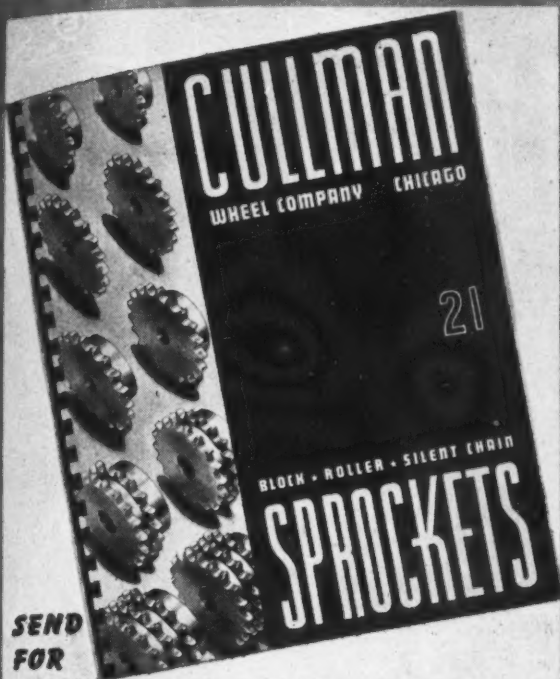
**THE BAIRD MACHINE COMPANY**  
 STRATFORD, CONN.

**JONES MACHINE TOOL WORKS, Inc.**

*Manufacturers of*

**VERTICAL SHAPERS • SLOTS • STRAIGHT EDGES**  
**VERTICAL BORING MILLS**  
**HORIZONTAL BORING MILLS**  
**SURFACE PLATES AND SPECIAL MACHINERY**

**King of Prussia, vicinity of VALLEY FORGE, PA.**



SEND  
FOR  
YOUR  
COPY

## How to Order SPROCKETS

If you specify or purchase sprockets, you should write now for the Cullman Wheel Company Sprocket Catalog.

It contains much essential information of value. It lists thousands of sprockets available both from stock and to order. It describes many different styles and kinds. It tells how to select the correct chains and sprockets, and gives valuable information on installation, lubrication, and care of high speed roller chain drives.

The Cullman Wheel Company Sprocket Catalog gives much useful data and many tables that will help save time and money for those who order or specify sprockets.

More than 50,000 Sprockets in Stock

**CULLMAN WHEEL COMPANY**  
1352-M ALTGELD ST., CHICAGO 14, ILL.

this man is  
\*identifying STEEL  
*positively*



Provided with a known sample of most rolled or forged ferrous alloys, he can tell instantly if unknown pieces of almost any size or shape and in most stages of processing are: (1) of the same or different chemical composition, if the physical structures are the same; (2) of the same or different heat treatments, if the chemical composition is the same.

Identometer is a new and valuable tool for metallurgical separation. Stocks can be identified on receipt and stored correctly according to type. Material *should* be checked before expensive machining and processing is begun. Stocks that have been mixed can be quickly and accurately re-sorted.

Identometer works on the principle of thermoelectricity. It is portable, speedy, and accurate. For a quick summary of what it is and how it works, just write for Bulletin 315 Address DRAVO CORPORATION, National Department, 300 PENN AVENUE, PITTSBURGH 22, PENNSYLVANIA.

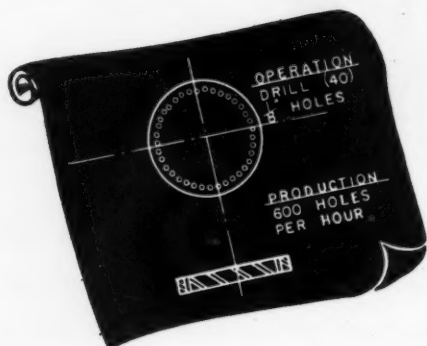


AN ELECTRICAL INSTRUMENT FOR THE INSTANT AND ACCURATE IDENTIFICATION OF MOST ROLLED OR FORGED FERROUS ALLOYS BY THE USE OF REFERENCE SPECIMENS

MACHINERY, August, 1944—369



# *Avey* Automatic METHOD No.3



## THE *Avey* CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

**designed for simple  
automatic indexing  
(vertical application)  
when duplication of  
operation is required  
about a center and  
in the same plane**

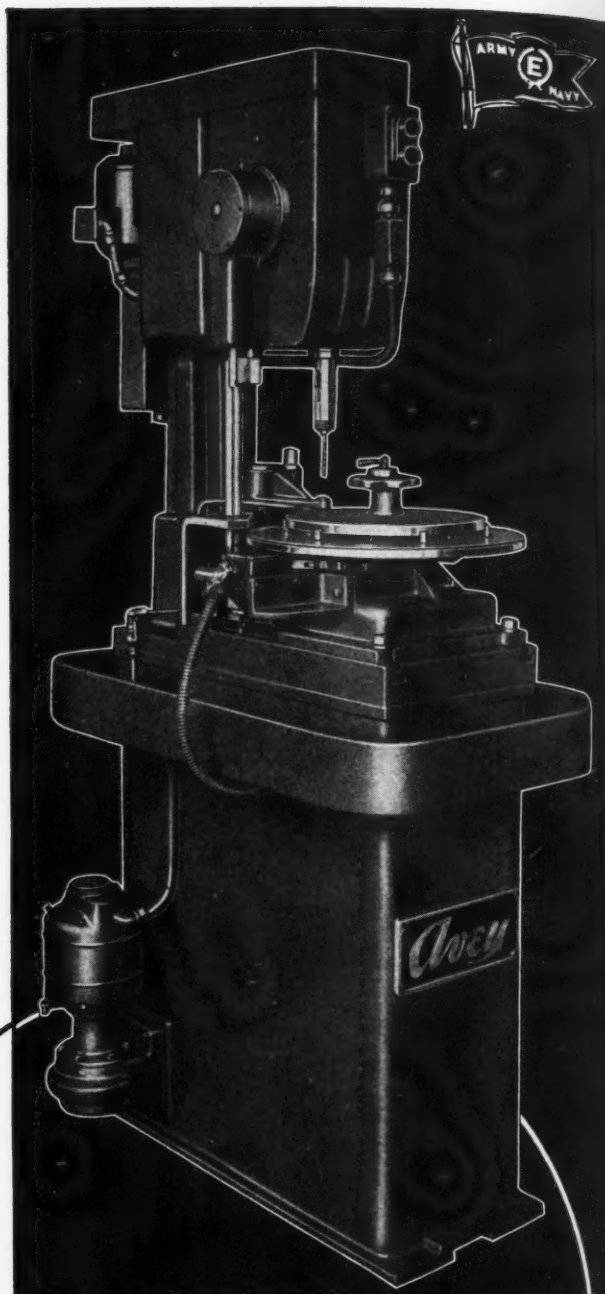
THE AVEY DRILLING MACHINE CO.  
CINCINNATI • OHIO • U. S. A.



# *Avey*

DRILLING  
MACHINES

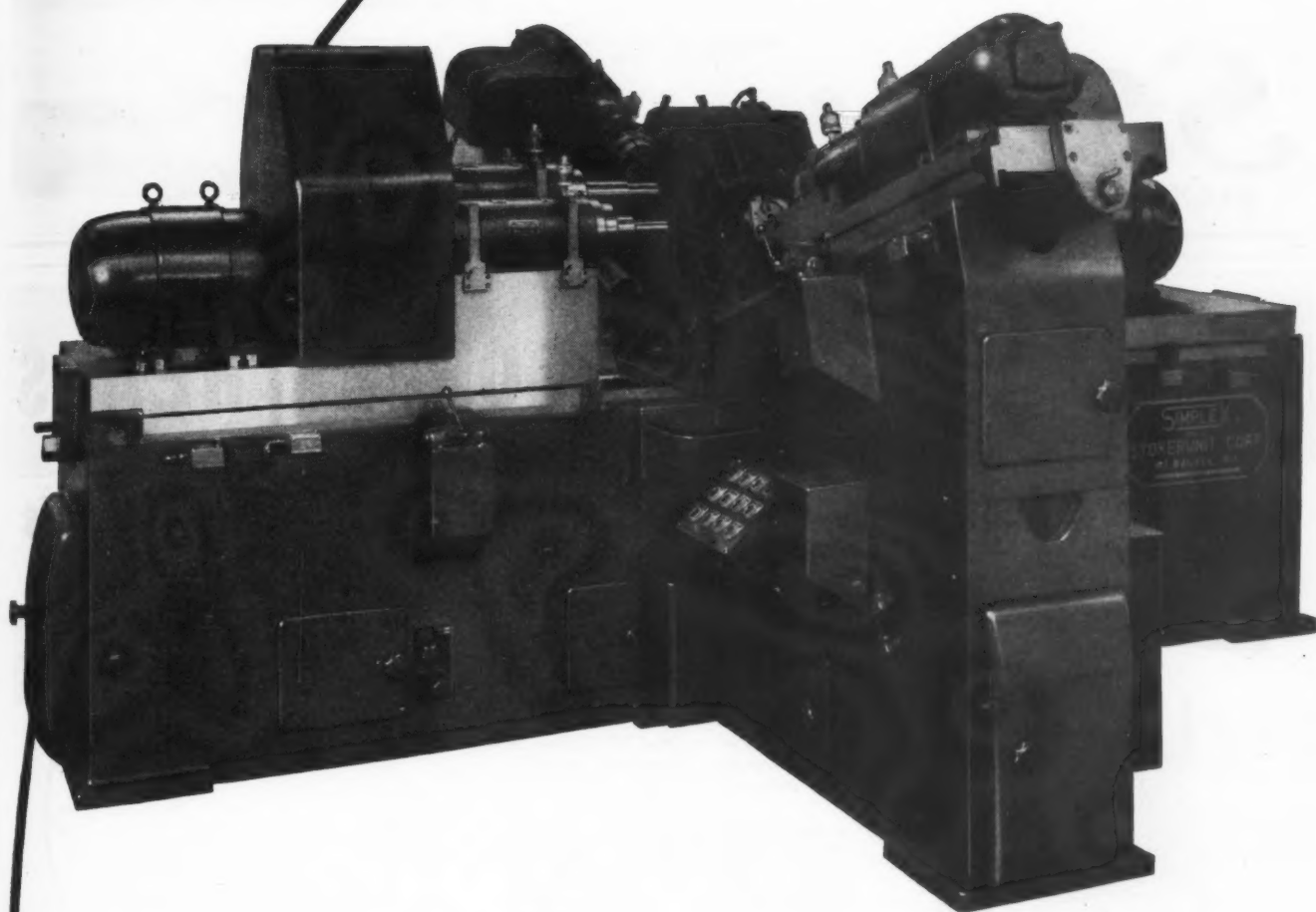
The Avey Cam Feed Unit (Avey Automatic Method No. 3)—a low capital investment, continuous operation enabling operator to devote time to another job. Decreases the cost per piece — enabling semi-skilled operators to deliver high quality production speedily, accurately, efficiently and with a minimum of supervision.



New designs and new materials, fashioned to tolerances never before possible, must be finished rapidly and economically. The new way—a machine with precision spindles, precision spaced, performing all important and correlated operations at one setting of the piece. It may be the answer to your problem now, next month or next year.

# **SIMPLEX**

This SIMPLEX 2U 4-way 10-spindle Precision Boring Machine has made a production item of an intricate gear case which had been practically a tool-room job—yet it has sufficient inherent flexibility to permit it to be adapted to normal development changes as they occur.



## **Precision Boring Machines**

**STOKERUNIT CORPORATION**

**SIMPLEX Precision Boring Machines and Planer Type Milling Machines**

4526 West Mitchell Street, Milwaukee 14, Wisconsin

MACHINERY, August, 1944—371

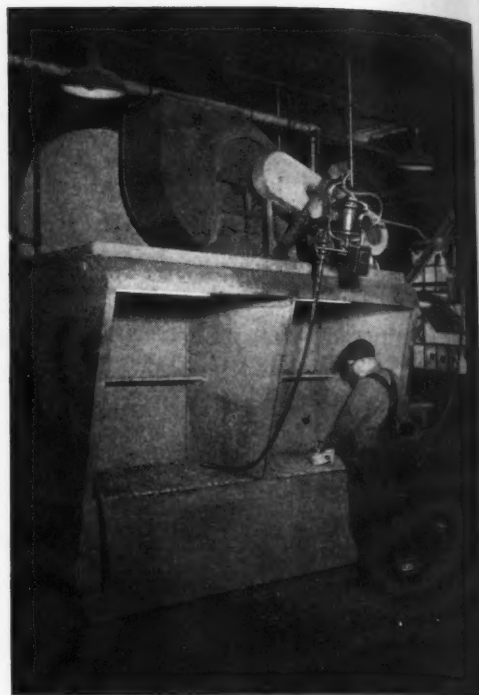
# Filing . . Polishing AIRCRAFT PARTS *with the customary STRAND ease!*

The usual "aircraft" care and consideration to the production of parts are easily attained with the use of Strand Flexible Shafts, as indicated by the photo at the right. This photo shows how these smooth-running, easy-to-handle Strand units are applied to the speedy polishing of magnesium aircraft parts at the John Deere Harvester Works of East Moline, Ill. The Strand units visible in the photo (Type MWV—speeds 1950, 3675, 5200 RPM) are also used to advantage with a rotary file for quickly cutting rough spots in small openings of the castings. Strand Flexible Shafts are ideal for performing this type of work with speed, efficiency, economy and convenience. Wherever portable rotary power is needed—for grinding, polishing, filing, buffing, sanding, drilling, reaming—use Strand equipment! Full details will be sent upon request.

**N. A. STRAND & COMPANY**

5001 N. Wolcott Ave.

CHICAGO 40, ILL.



## Strand

FLEXIBLE SHAFTS

### DETAILS OF STRAND CONSTRUCTION

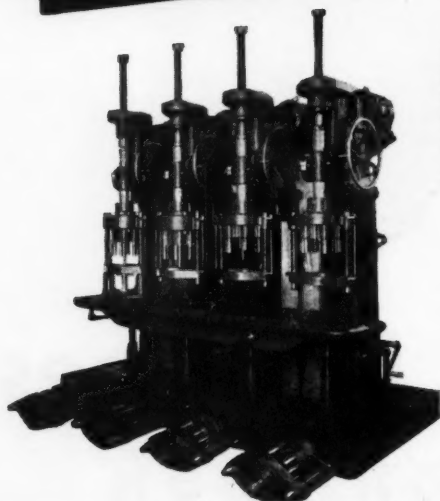
A—Core End. B—Swivel Coupling Nut. C—Tail Piece for Coupling Nut. D—Perforated. E—Steel Reinforcement. F—Inside Liner. G—Wire Core Shaft. H—Asbestos Packing. I—Stop Wire. J—Metal Tubing Interlocking Joints. K—Metal Braiding. L—Vulcanized Rubber and Canvas Cover.



## Versatility of

## HOEFER HEADS

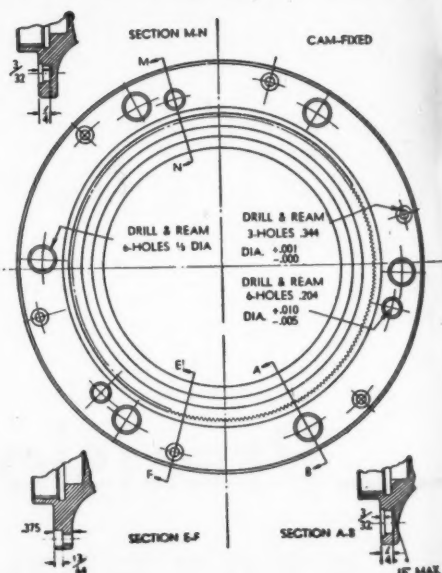
### Speeds Production in Many of America's Armament Plants



• The line drawing shows a typical job done by HOEFER Multiple Spindle Heads. The machine at left drills and reams 15 holes in three different diameters and to three different depths.

• HOEFER Heads used for such important work as that of armament production adds further proof to the ability of these heads to simplify the drilling of holes in multiple and to speed up the work. Also it suggests the great value these heads can be to you in your post war production.

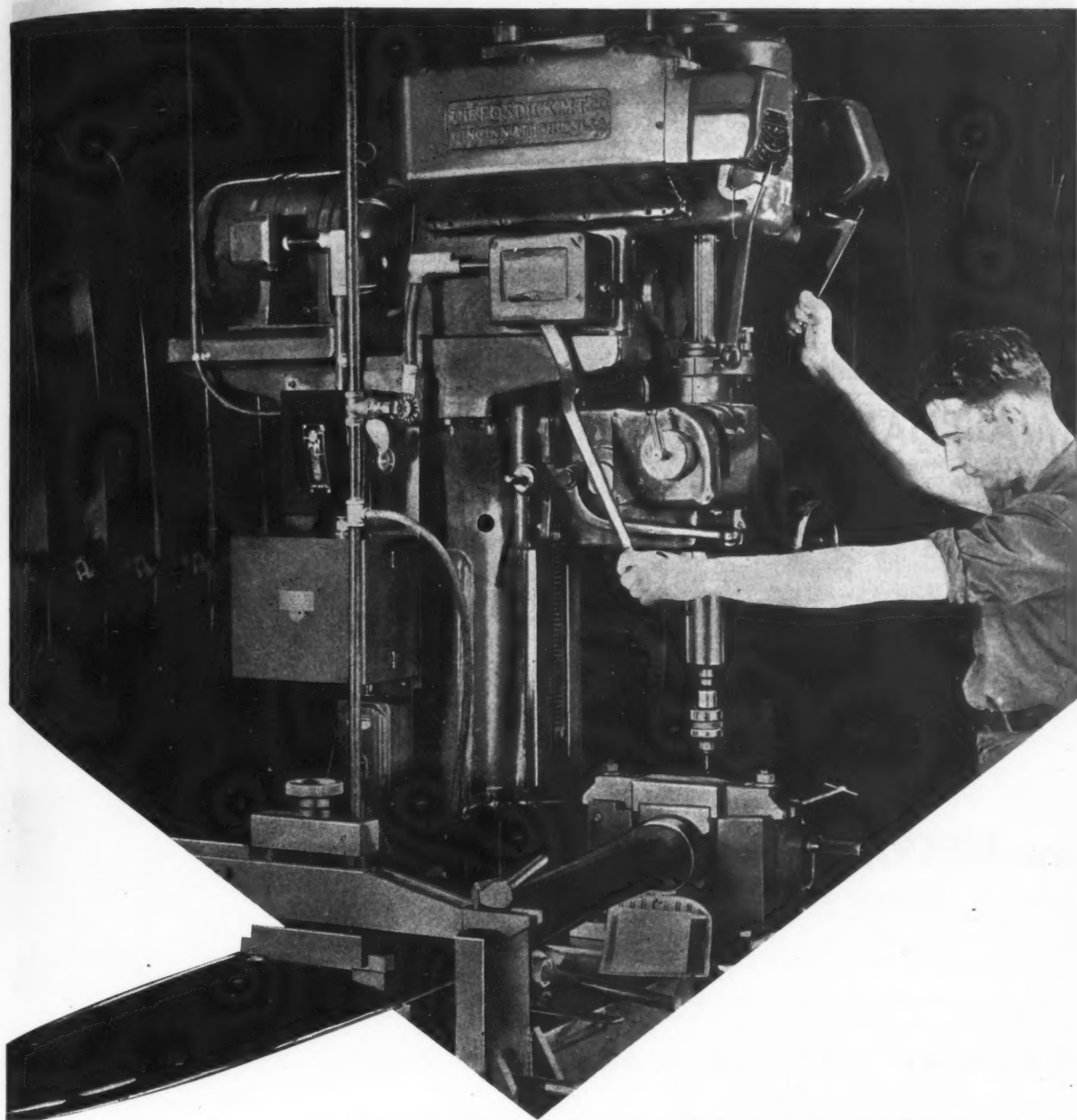
• Due to our long years of experience in producing multiple spindle heads for a wide variety of applications we are in position to study your problem and suggest the correct head to fully meet your production need. Send us your blueprints and number of parts you need for one day. Save on the purchase of costly drilling equipment.



**Hoefer's Whole Business is Holes . . . .**

**HOEFER MFG. CO.** Freeport, Ill.





## FOSDICK PRECISION SPEEDS PROPELLER PRODUCTION



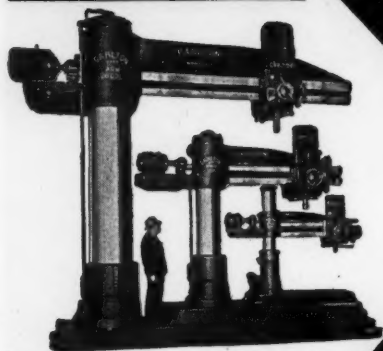
It won't be long now . . . before the propellers shown in production at one of the Curtiss Propeller plants (above) will be droning away at some airport, ready to start a fighting plane into the sky and into the fray. Fosdick Drilling Machines, like the one shown perform-

ing a precision operation on the hub end of propellers, are doing their part to step up the nation's plane output. Unusual accuracy and ease of control permit precision work to be performed without waiting for special jigs and fixtures. *SEND FOR BULLETIN.*

# FOSDICK

## MACHINE TOOL COMPANY

CINCINNATI 23 . . . OHIO



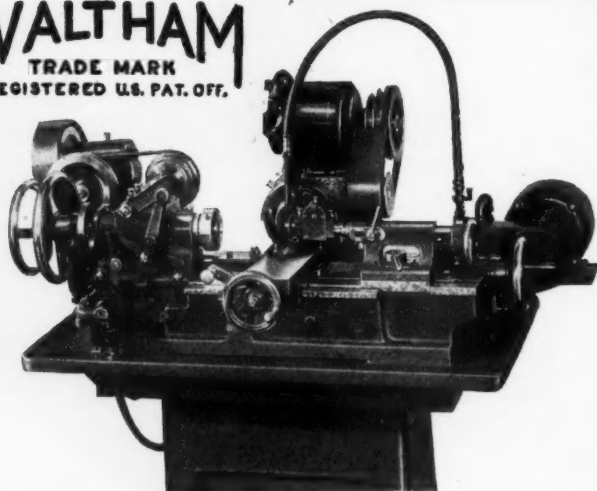
# CARLTON

» Carlton Radial Drilling Machines are in use in many of the United States Naval Yards throughout the country. They are also being used by the regular commercial ship builders and by sub-contractors such as—steel mills, the large electrical companies, and others supplying materials for the construction of ships.

THE CARLTON MACHINE TOOL CO., Cincinnati, O.

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TRADE MARK  
REGISTERED U.S. PAT. OFF.



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Consider the WALTHAM THREAD MILLER for the accurate threading of small parts. Easily set up to produce all types of small threaded parts. Can be had for internal threading or for cutting relieved threads on taps, small hobs, multiple cutters, etc.

Send for Bulletin No. 210 or send drawings or samples for estimate.

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Newton Street, Waltham, Mass.

Makers of Small Thread Millers, Gear Cutters and other Small Automatic Machines

## How to apply the HORIZONTAL ROTO-MATIC for increased Drilling Production is described



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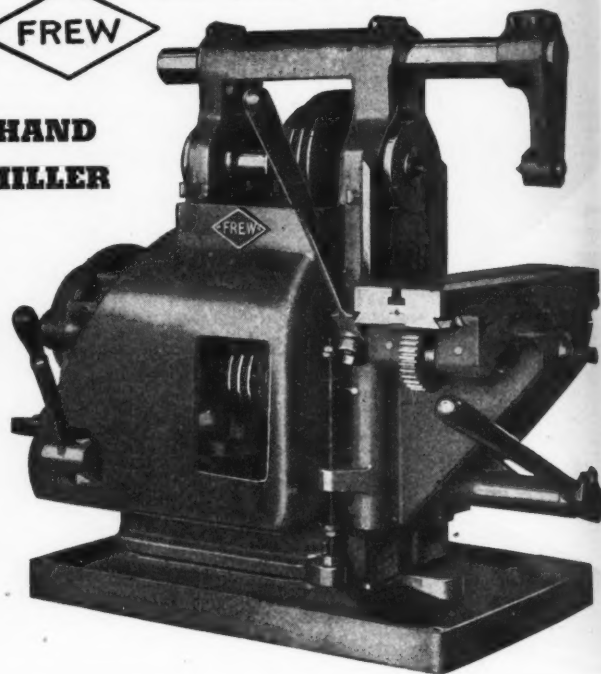
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FREW

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MILLER

Get better production and release larger machines for large work! Use the FREW Hand Miller for accurate, economical production of small parts. Heavy construction and "big machine" features guarantee accuracy on heavy cuts. Table size 16 3/4" x 5 3/4" makes a wide range of work possible. V-belt drive and Timken-equipped spindle assure smooth operation at all speeds.



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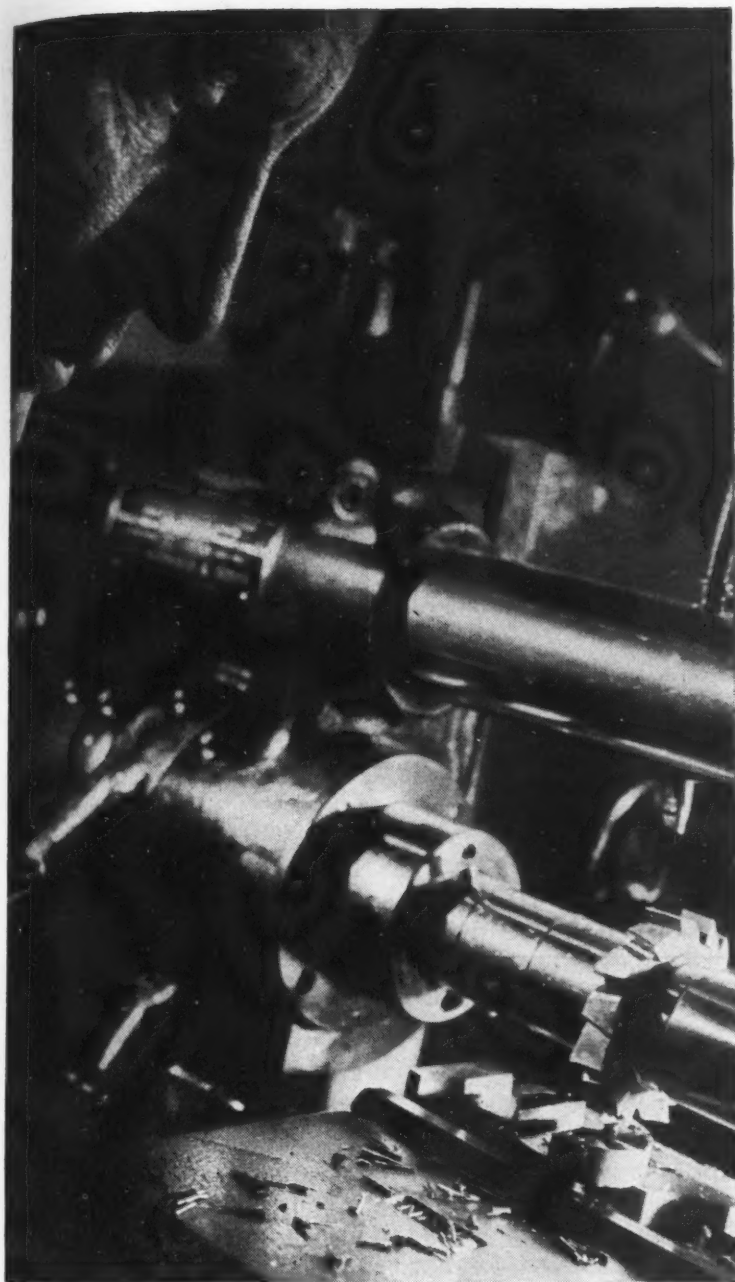
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for accuracy and speed  
in hobbing pinions, gears  
and sectors.

Two Models  
No. 00 SPUR GEAR HOBBER  
for work up to 2" dia.  
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Manufactured by  
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Hamilton, Ohio



## LOWER COST per piece milled

**WHETHER YOURS** is a large plant or a small shop you will be interested in the low-cost-per-unit-of-production features of the Nichols Miller.

Take these performance records:

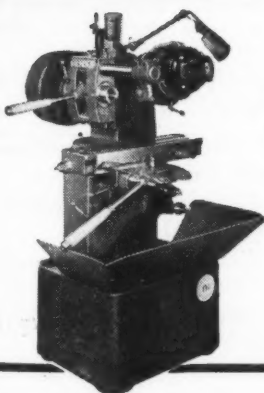
A broaching machine was originally used to cut a wrench slot in a bearing. Output, 3,000 pieces every twenty-four hours. The job was placed on the Nichols Miller with a specially designed fixture and production immediately increased to 9,000.

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MACHINERY, August, 1944—375



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### PROCUNIER SAFETY CHUCK COMPANY

16 S. Clinton St., Chicago, Ill.

Send me bulletins on: ☐ High Speed Tapping Heads.

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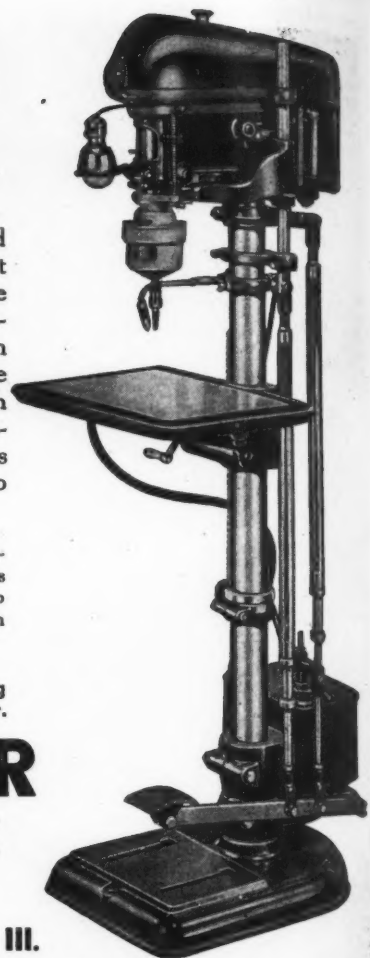
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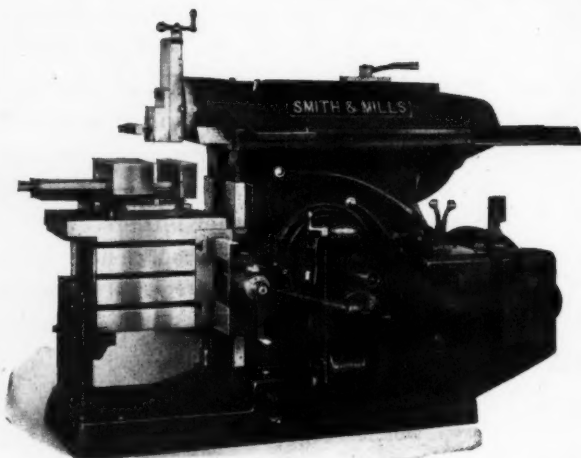
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## PROCUNIER SAFETY CHUCK COMPANY

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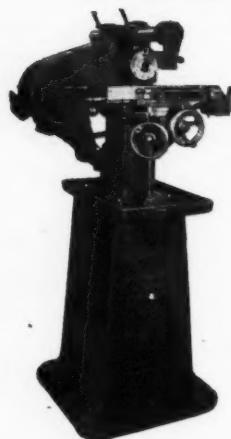


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A Smith & Mills Shaper that gives you tool room accuracy on production jobs at the speed and ease of control you demand in the shop. Write for catalogue and specifications on all sizes from 12" to 32" stroke.

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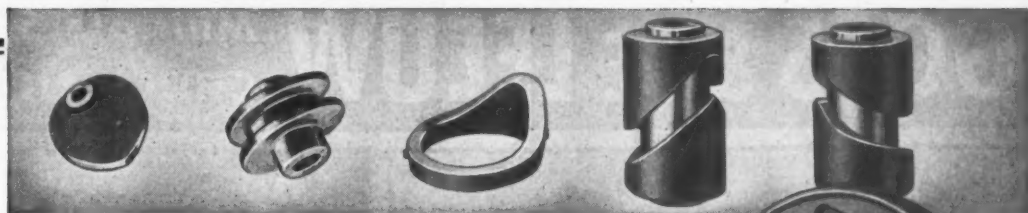
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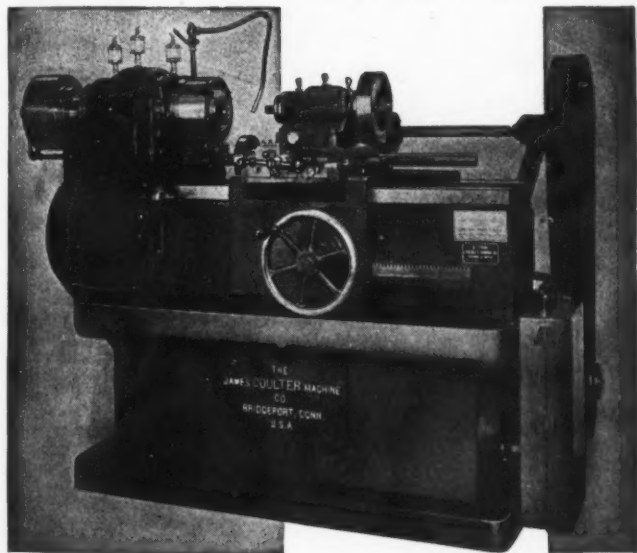
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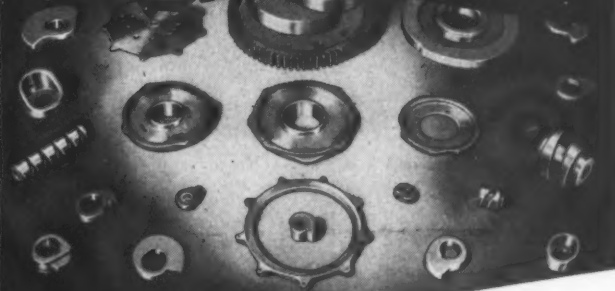
*Thread  
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Thread production—internal or external, right or left hand—through automatic, cam-controlled action! In the Coulter Type H Hob Thread Miller work and cutter spindles are individually motor-driven, permitting high output on any type of work that can be chucked. Maximum external thread, 7"; minimum internal thread depends on size of hob. Write for full details.



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## CAMS

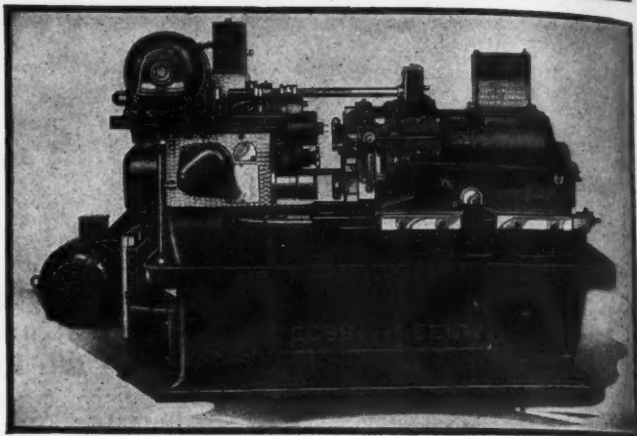
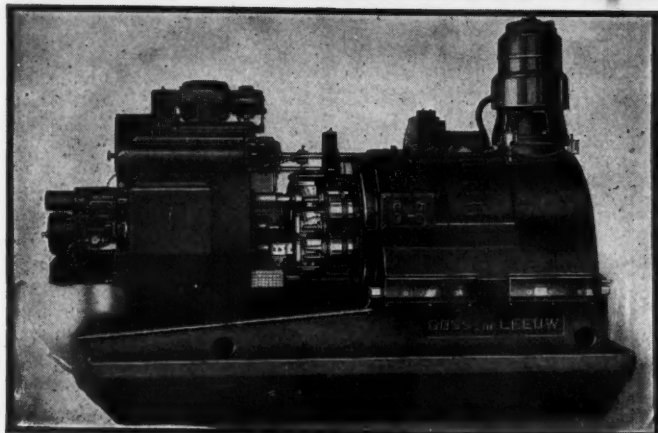


LET the largest, most completely equipped cam milling and grinding plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

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TYPE**

5 Spindles  
6 Spindles  
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## Features include:

Lead Screw Threading on both types—Pre-loaded Anti-friction Spindle Bearings—Hardened Ways—Oversized Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

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ROTATING  
TYPE**

4 Spindles  
5 Chucking  
Positions

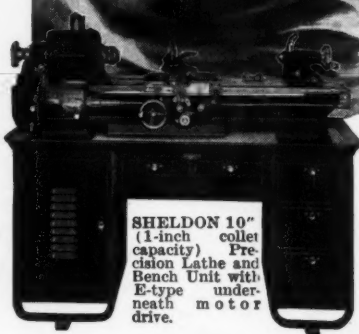
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**By the Army, the Marines  
and the Navy, too**

SHELDON Precision Lathes have been selected by the Army for its Mobile Machine-Shop Units, by the Marine Corps for its trailerized shops and by the Navy as the ideal lathes for several types of repair shops aboard ship and ashore.

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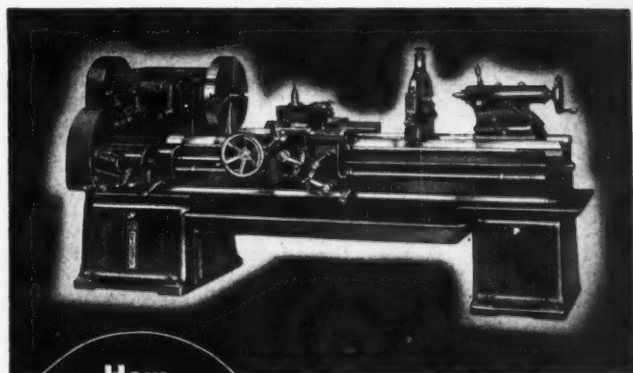


**SHELDON 10"**  
(1-inch collet capacity) Precision Lathe and Bench Unit with E-type under-neath motor drive.

# SHELDON

**SHELDON MACHINE CO., INC.**

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**How  
to keep your  
Metalmaster  
working for  
Victory!**

**For sustained accuracy—  
WATCH THOSE  
BED WAYS!**

To keep your Metalmaster Lathe working at top accuracy, take these precautions with the bed and bed ways: WIPE the ways occasionally

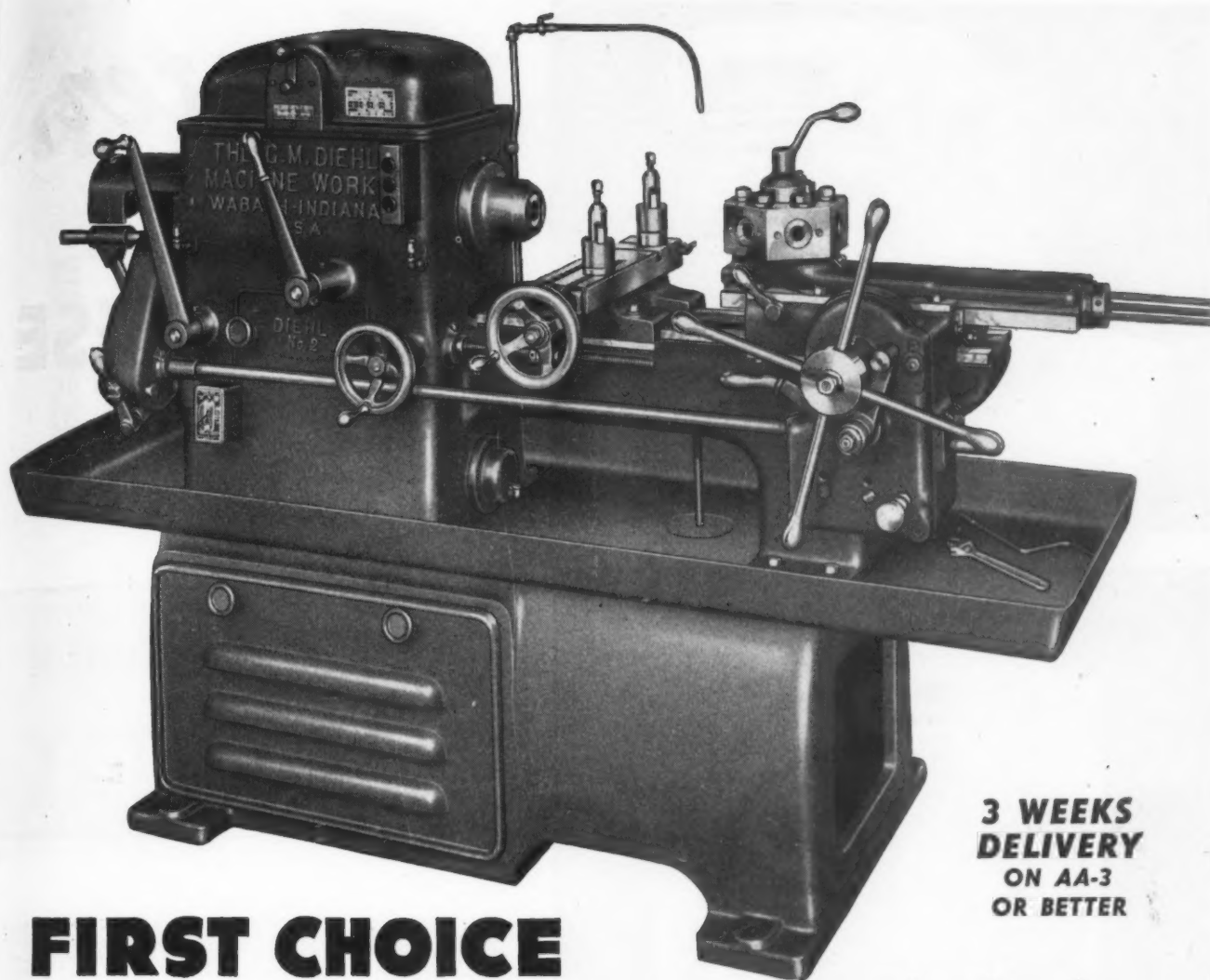
to remove dirt, fine chips and cast iron dust which acts as an abrasive and makes precision work difficult after a while. (The carriage wings of your Metalmaster are provided with synthetic rubber shear wipers to clean the ways as the carriage is moved, but an occasional wiping by hand will help.) NEVER use a grinding wheel on the lathe without covering the ways to prevent emery from falling on them; then wipe the ways with a clean cloth saturated with oil to pick up any loose dust and grit. EXAMINE the ways occasionally to detect marks or chipping; if found, file the spot carefully to a smooth finish, but don't file holes which will cause the carriage to bump along.

**THE BRADFORD MACHINE TOOL CO.**  
671 Evans Street, Cincinnati, Ohio



1840-1944





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DELIVERY  
ON AA-3  
OR BETTER**

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The Diehl No. 2 Turret Lathe is designed to meet the demands for an economical lathe capable of turning out accurate work to exacting specifications. That's why it is first choice in many manufacturing plants today.

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Six speeds ..... forward and reverse.

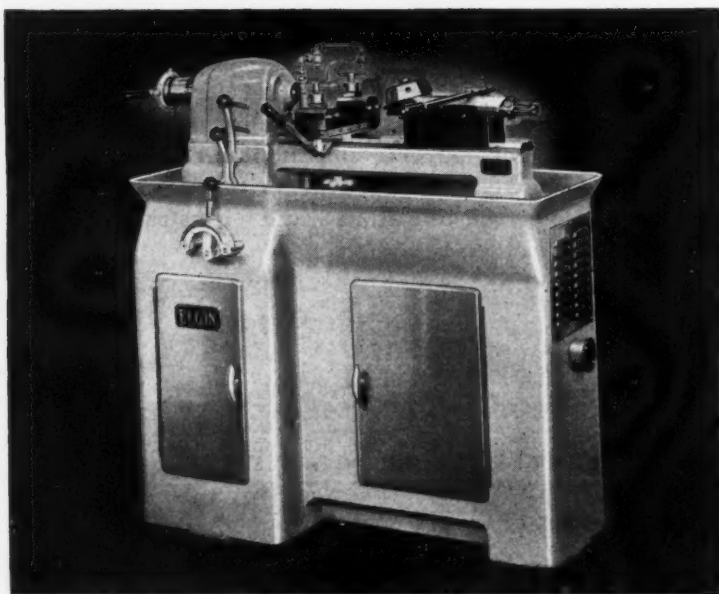
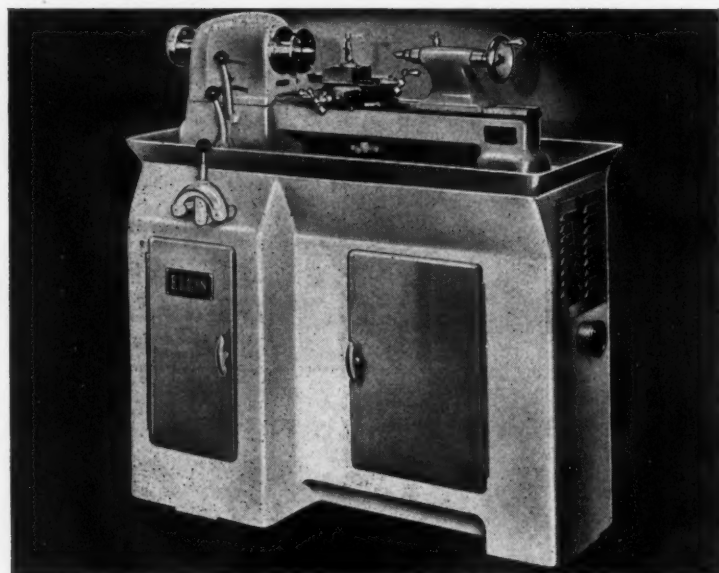
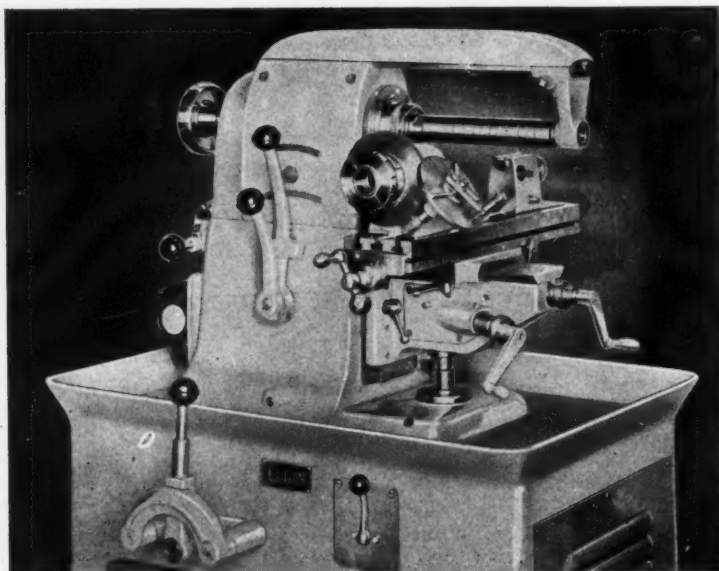
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*The G.M.* **DIEHL** *Machine Works, Inc.*

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Where precision  
craftsmanship  
is honored



The Elgin Precision Vertical Milling Machine (not illustrated) has table 4½" wide x 18" long, preloaded ball bearing spindle of 9/16" capacity, with five speeds available ranging from 400 to 4000 RPM.

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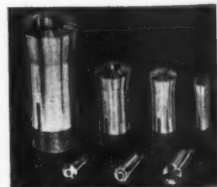
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**Top: HORIZONTAL BENCH MILLING MACHINE**—any spindle speed from 85 to 2750 R.P.M. by a flick of the Variable Speed Drive Lever. No back gearing necessary. Collet capacity 1". Directly reversible. Table 4½" x 18". Longitudinal travel 12". Transverse travel 6". Vertical travel 6".

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**Bottom: HAND SCREW MACHINE**—also features the Variable Speed Drive for any spindle speed from 120 to 3780 R.P.M. without stopping spindle or holding up the job. Collet capacity 1". Swing 9". Directly reversible. Heavy duty double tool cross slide.



Elgin Collets available in all types, all sizes. You can depend upon Elgin for top-rate design, action, performance.



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*... better Production*

# ELGIN MACHINES

**can change Spindle Speeds  
by a flick of this Lever!**



No more drudgery when changing speeds! No need to stop the spindle to shift the belt! An easy flick of the Variable Speed Control Lever on Elgin Precision Bench Machines instantly brings any desired speed exactly in accordance with the requirements of succeeding operations. The three Elgin Machines listed at the left are modern in every detail of design, construction and operation. The Variable Speed

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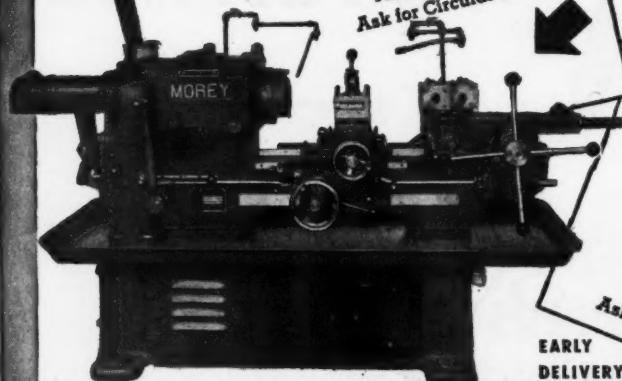


# MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL  
or PLAIN

## #3 UNIVERSAL

For bar stock up to 1½" in diameter  
10" turning length  
16½" swing over bed  
Infinite spindle speeds: 55 to 1800 RPM.  
constant speed motor, 1200 RPM  
AVAILABLE ALSO WITH  
PLAIN CROSS SLIDE  
Ask for Circular 727A



EARLY  
DELIVERY

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For bar stock up to 1" in diameter  
Turning length 6½"  
Swing over cross slide 6"  
Swing over bed 14"  
Infinite spindle speeds:  
Minimum of 60 RPM.  
Maximum of 2000 RPM.  
Constant horsepower at all speeds.

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Infinite spindle speeds: 35 to  
1500 RPM, constant speed  
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INFINITE SPINDLE SPEEDS  
—Electrically Selected—



DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS  
ELIMINATES GEAR MARKS  
(patents applied for)



GEARED SPINDLE SPEEDS  
INSTANTLY AVAILABLE  
THROUGH MULTIPLE DISC  
CLUTCHES.



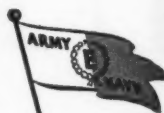
SPINDLE MOUNTED ON  
TIMKEN BEARINGS.



RIGID—WITH SUFFICIENT  
POWER TO TURN AT THE  
HIGHEST SPEEDS AND  
FEEDS MODERN TOOLS  
WILL WITHSTAND.



SPINDLE SPEEDS AND  
POWER FEED CHANGES  
WITHIN EASY REACH OF  
OPERATOR.



THE DESIGN OF  
THE MOREY No. 2, 3 and 4 TURRET LATHES ARE  
BASICALLY ALIKE. EACH  
MACHINE IS ENGINEERED FOR THE SIZE  
WORK IT IS DESIGNED  
TO HANDLE.

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Variable  
Speed

SPEED  
LATHES

for  
PRECISE  
LAPPING  
OF  
GAGES



Ideal  
FOR  
FINAL  
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OPERATIONS

Speeds as low as 20 r.p.m., for accurate lapping of gages, and as high as 4,000 r.p.m., (with ample power for rotating heavy work), for de-burring, polishing, filing, etc., are available in these foot-operated speed lathes. Speeds are infinitely variable. Write for Catalog 440.



**SCHAUER MACHINE COMPANY**

ORIGINATORS OF TODAY'S SPEED LATHES  
2069 READING ROAD ... CINCINNATI 2, OHIO

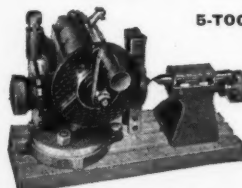
382—MACHINERY, August, 1944

**Convert** any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.



rigidly held. **6 Days Delivery.**

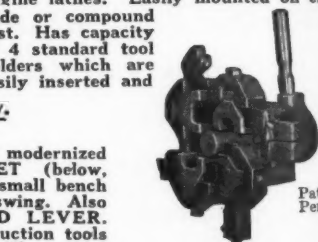
• Then there's the completely modernized 5-tool TAIL STOCK TURRET (below, right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.



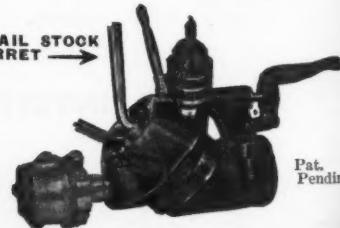
Above: 7½" Swivel Base  
Dividing Head.

In Stock—  
Immediate Delivery  
No Priority Required

Some territories still open for dealers and salesmen.



4-TOOL TOOL-POST  
TURRET



Pat.  
Pending

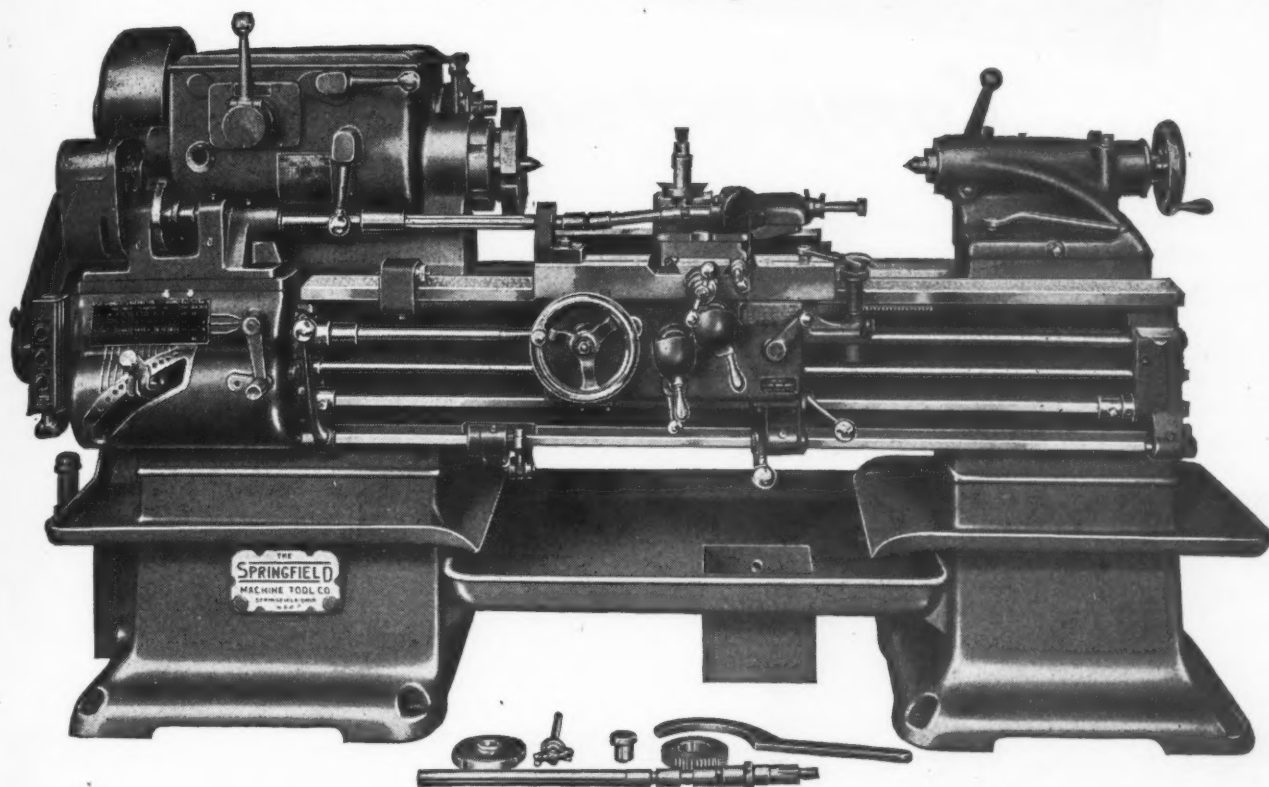
• Also—Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyrotory Foundry Riddles.

**JEFFERSON MACHINE TOOL CO.**

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*Hours of heavy duty operation*

*... yet the* **SPRINGFIELD LATHE**  
*maintains Accuracy for Precision Work!*



**T**HE Springfield answers today's demand for a lathe that is sturdy enough to stand up under long hours of uninterrupted operation, that can take the heaviest of roughing cuts without slipping or chatter—and yet maintain without deviation the **close limits of accuracy** so vital to the successful mass production of precision parts for fighting equipment and that assures you the speed production plus top-grade workmanship that wartime schedules call for!

Check over these Springfield features that mean maintenance of accuracy: BED permanently true, eliminating internal strains, preventing scoring and marring under severe service. Extra heavy APRON operating on

best available ball and bronze bearings. Sturdy COMPOUND REST that sets firmly under heaviest pressures. GEARS of chrome molybdenum, hardened and lapped. LEAD SCREWS of high carbon steel checked for accuracy to limits of .001" to the foot. All other parts similarly designed for efficient function, accuracy and long wear, each built of the materials that most effectively contribute those qualities.

If your problem is producing a high output of accurate work on lathes with no danger of trouble, delays, production stoppage—send for a copy of Bulletin No. 162 with additional data about the Springfield Lathe. There is no obligation.

SEND TODAY FOR  
BULLETIN NO. 162

THE SPRINGFIELD MACHINE TOOL CO.

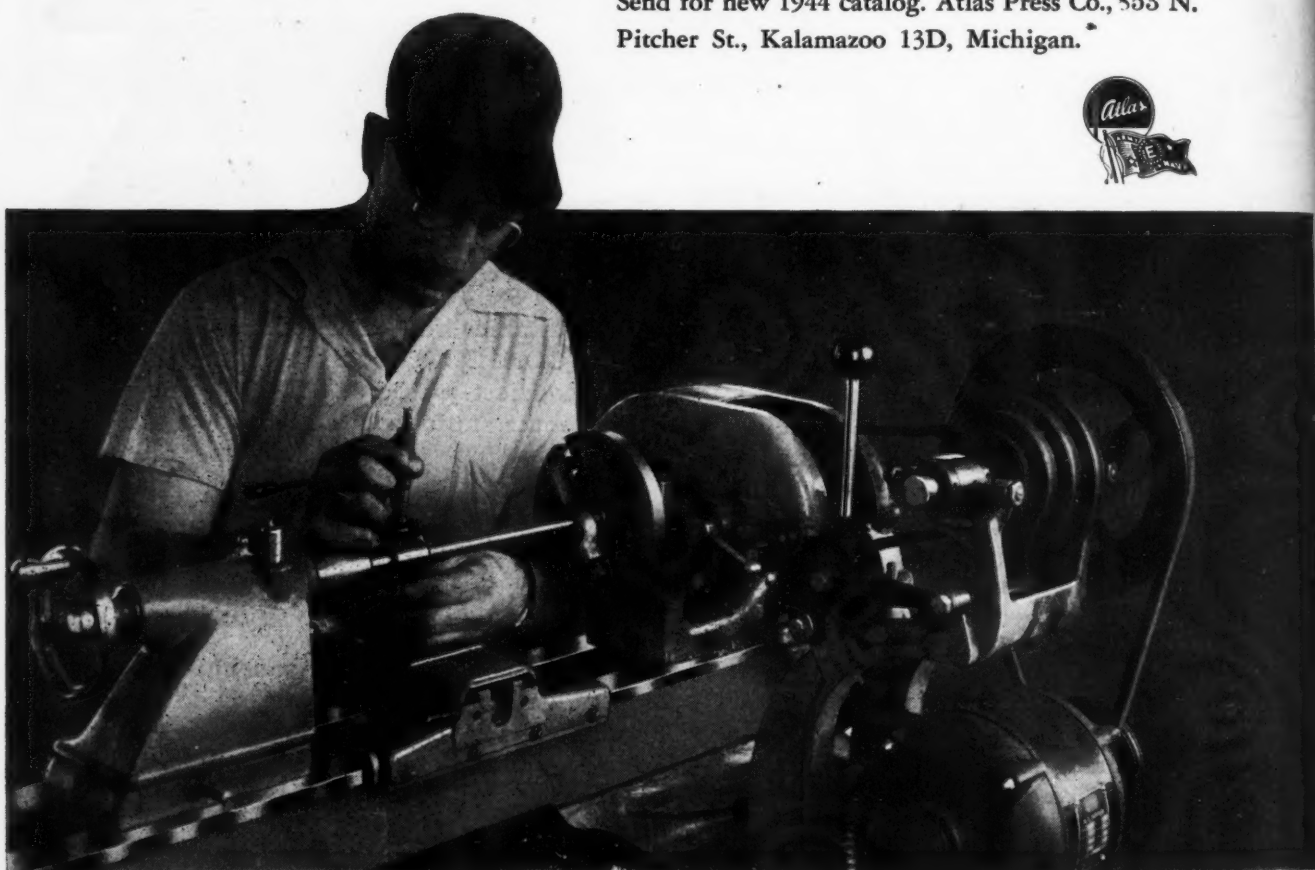
SPRINGFIELD, OHIO

# Atlas 10" LATHES

## *Compact and Capable*

The performance record of Atlas 10" lathes in thousands of war plants forecasts a new advance in production engineering for peace. Today, these compact, capable machines are delivering precision work formerly entrusted only to larger, far more expensive equipment. Production records show that Atlas lathes and other tools handle most small parts machining operations much more efficiently and economically than the larger machines. If your postwar production plans call for operating flexibility, low machine-hour costs, and inexpensive machine investment, get the data on Atlas.

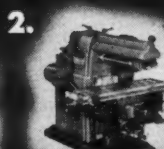
Send for new 1944 catalog. Atlas Press Co., 853 N. Pitcher St., Kalamazoo 13D, Michigan.



**4** *Atlas*  
**TOOL TEAM**  
FOR  
**SMALL-PARTS MACHINING**



LATHES



MILLING MACHINES



SHAPERS

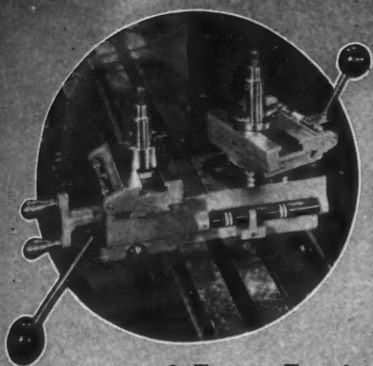


DRILL PRESSES

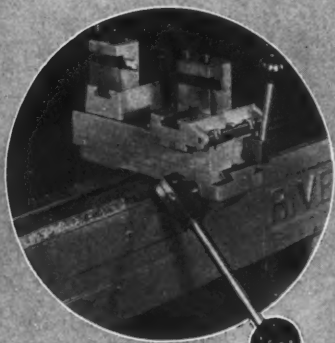


# RIVETT

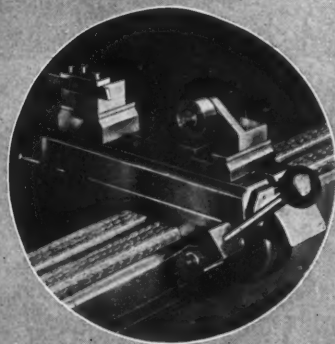
## FOR BAR OR INDIVIDUALLY CHUCKED WORK REQUIRING UP TO EIGHT SUCCESSIVE OPERATIONS



**Straight and Taper Turning  
Slides**



**Straight Turning Slide and  
Fixed Block**



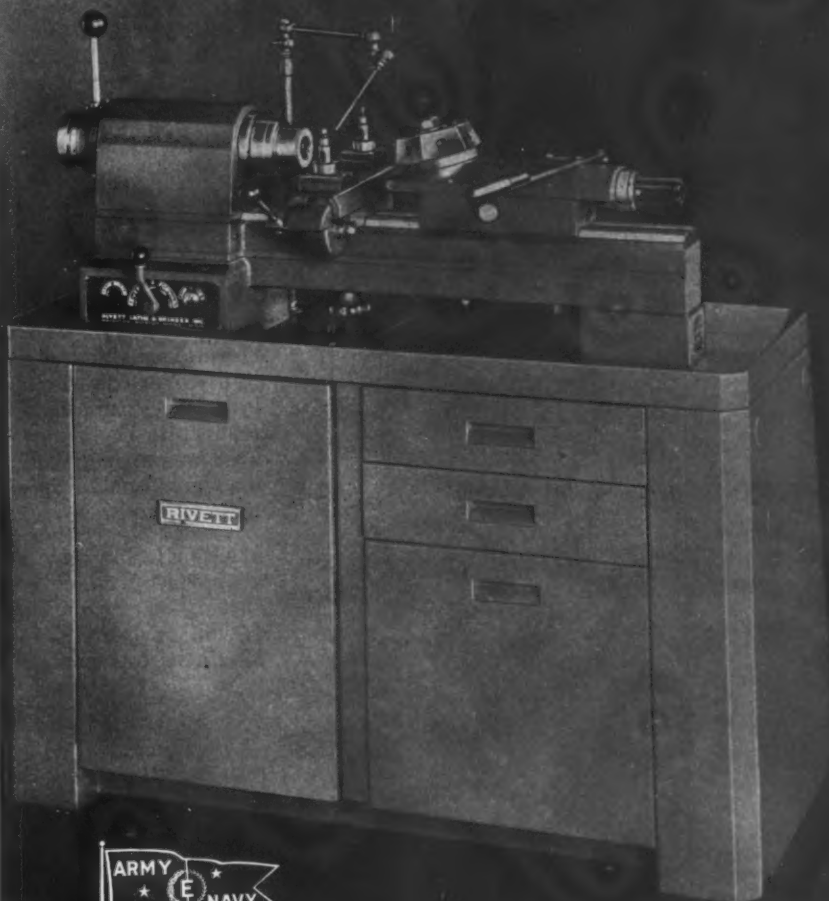
**Cutting-Off and Forming  
Blocks**

### SPECIFICATIONS

Swing over bed, dia. ....9"  
Distance between spindle mouth  
and face of turret  
With draw-in collet .....14½"  
With push-out collet .....13½"  
Collet capacity:  
Draw-in type, max. dia. ....1"  
Push-out type, max. dia. ....1"  
Step chuck capacity, max. dia. ....6"  
Jaw chuck capacity, max. dia. ....6"  
Spindle capacity, max. dia. ....1½"  
Travel of turret slide, max. ....4½"  
Number of tool holes in turret .....6  
Dia. and depth of tool holes ..¾" x 1"  
Swing over double tool slide ....4½"  
Cross travel of double tool slide ...3"  
Travel of straight turning slide ..2¼"  
Travel of taper turning slide ....2¼"  
Spindle speeds, eight forward and  
reverse:  
Low range .....150 to 2500 r.p.m.  
High range .....225 to 3750 r.p.m.  
Weight of hand screw machine,  
mounting and drive, net 900 lbs.

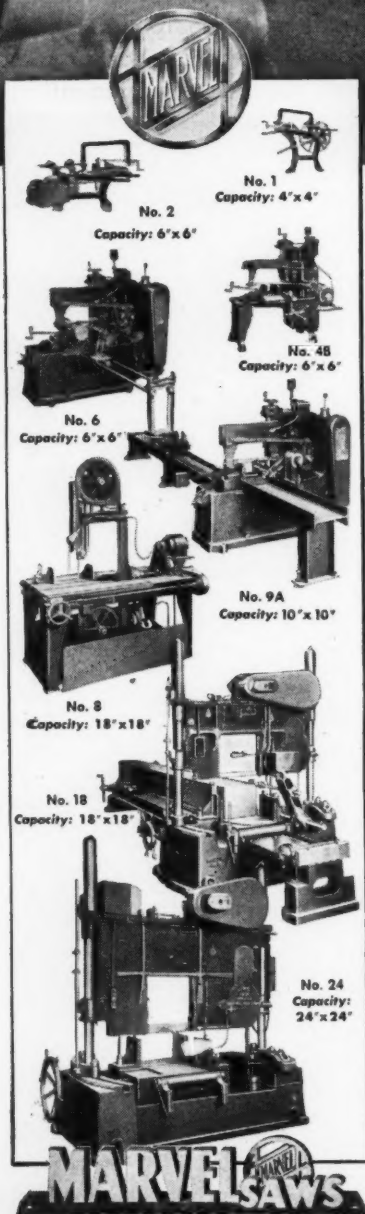
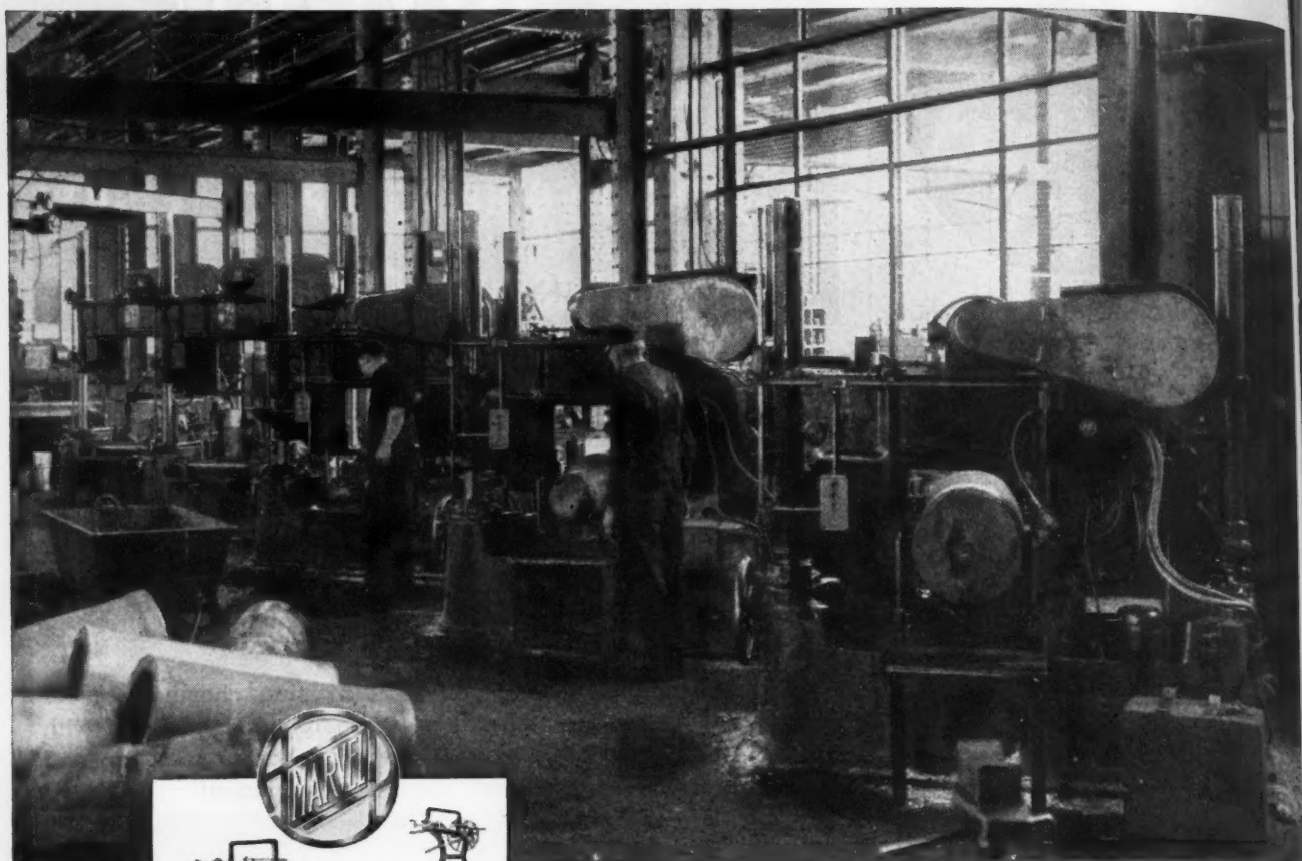
The Rivett No. 918 Hand Screw Machine incorporates precision, balanced design and operating features to make it an efficient producer on small duplicate parts. Work requiring up to eight successive operations can be finish-machined at one chucking. Bar stock passed through spindle may be held in push-out collet, while work individually chucked may be held in draw-in collet, step chuck or jaw chuck. In combination with six turret operations, double tool slide may be set up for straight or taper turning, forming or cutting-off.

Other combinations are available using chasing bar for internal or external threading, or compound slide rest with turret tool post. Steel cabinet mounting has rimmed top and sump for cutting oil. Bench mounting is optional.



# RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.



## Hack Saw Method Steps Up Locomotive Production

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work; for cutting-off car axles, wrist pins and all large forgings—work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Sawing machines, including eleven of these massive, ruggedly built giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

**ARMSTRONG-BLUM MFG. CO.**

"The Hack Saw People"

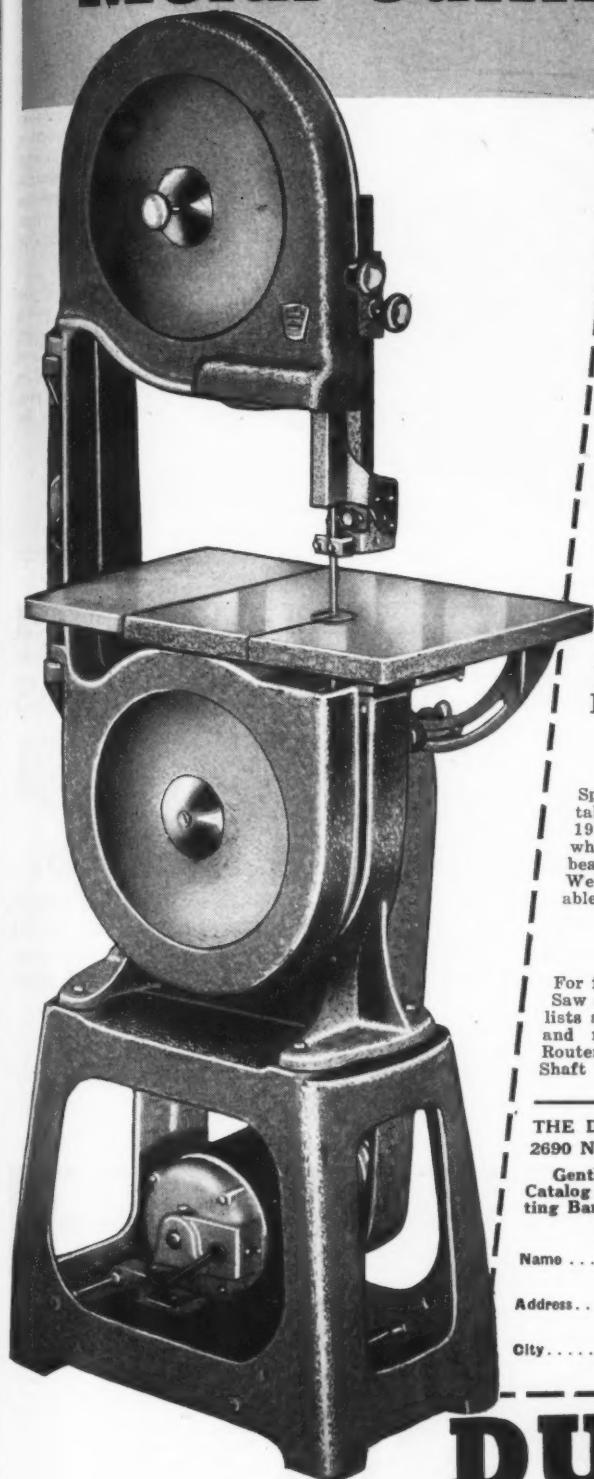
5700 W. Bloomingdale Ave.

CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.



# *A basically improved low-cost* **Metal Cutting BAND SAW**



Despite its unusually low price, this heavy DURO 16-inch production Metal Cutting Band Saw has many special features not found in machines costing several times as much. It is ideal for cutting tubing, extruded shapes, bar stocks, metal sheets, casting gates, plastics, brake linings, hard rubber, slate, fibre and many other materials. Can be adjusted to obtain standard wood cutting speeds by a flip of a lever. Some of its special features include: Heavy machined cast iron trunnion; special roller blade guides which reduce blade crystallization and lessen blade breakage; new design which permits all adjustments to be made from front while saw is in operation; New Departure Ball Bearings; machined dove-tailed ways with adjustable steel gibs; many other advantages. Metal cutting speeds: 230 and 596 R.P.M. Wood-cutting speeds: 2300 and 5960 R.P.M. Available on priority only.

## **HAS MANY EXCLUSIVE FEATURES**

Specifications include: 16" capacity: 10 1/2" capacity under blade; table working surface—23 1/2"x18"; 45° table tilt; height of base—19"; height of saw—51"; height from table to floor—41 1/2"; wheel diameter—16". Uses 4 New Departure ball bearings, ball bearing blade guides. Has built-in light. Blade is fully guarded. Weight of unit as illustrated, but less motor, 405 lbs. Also available in 15" model.

## **Send for New DURO Catalog**

For full details and prices on the DURO 16" Metal Cutting Band Saw send for latest DURO CATALOG using coupon below. Also lists specifications and prices of complete line of DURO single and multi-spindle Drill Presses, Circular Saws, Jointers, Routers, Shapers, Grinders, Lathes, Scroll Saws, Flexible Shaft Units and Portable Electric Drills.

THE DURO METAL PRODUCTS COMPANY  
2690 N. Kildare Ave., Chicago 39, Illinois.

Gentlemen: Please send me FREE copy of latest DURO Catalog giving full specifications on new DURO 16" Metal Cutting Band Saw and other DURO Machine Tools.

Name .....

Address .....

City..... Zone No..... State.....

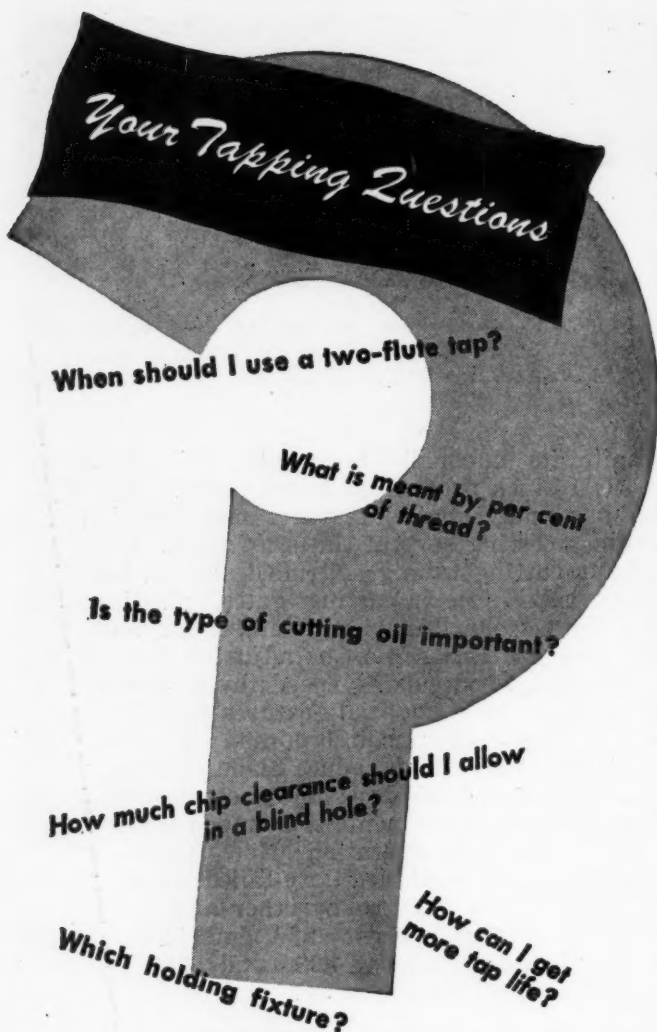


# **DURO TOOLS**

**MACHINE TOOL DIVISION**

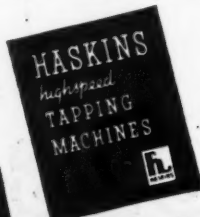
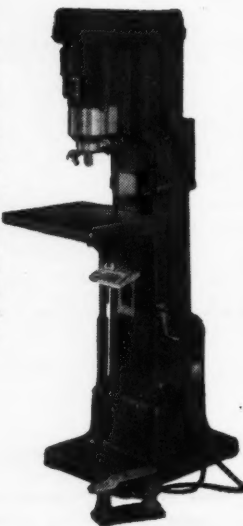
## **ALSO MAKERS OF DURO HAND TOOLS**





## Answered

These are some of the more common questions we answer almost daily. Precision tapping is a science in itself, and even an experienced operator will occasionally run into a snag—some new problem on which he can use a little outside help. When you reach that point—call on us. Our engineers are trained in the field. Draw on their experience and knowledge to reach a solution to your problem quickly and easily. Write for our catalog on Precision Tapping at High Speed. Send your questions to R. G. Haskins Co., 618, South California Avenue, Chicago, Illinois.



**haskins**

PRECISION TAPPING EQUIPMENT



**INVESTIGATE**

**Tannewitz**  
**DI-SAWS**

*and You'll Want No Other!*



Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ Di-Saws. Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ Di-Saw you can do in minutes jobs which require hours by the shaper, miller or lathe methods; and there's a size to accommodate work of practically any size. Get the facts. Write for "Di-Saw Bulletin."

**STANDARD MODEL No. M24 (24" WHEELS)**

Other Bulletins Worth Sending For:

"SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE."  
"SHEET METAL CUTTING BAND SAWS." A line will bring them promptly.

**THE TANNEWITZ WORKS, GRAND RAPIDS, MICH**

## SAWS for ALL METALS



Huther Bros. make the saw for your work—for brass, copper, aluminum, steel. Correct pitch, correct tooth form, correct steels—all contribute to maximum speed and efficiency. Write for our catalog of saws for every metal cutting need.

**Huther Bros. Saw Mfg. Co.**  
ROCHESTER NEW YORK



**WHEN EVERY SECOND COUNTS**

"THE TOOLMAKERS BEST FRIEND"

**GROB BROTHERS**  
GRAFTON, WISCONSIN

This small tool steel job was saved on the Grob Open End Band Saw in record time. Die illustrated with four openings completed in 12½ minutes including change over from opening to opening. Write for our catalog full of hints on saving many precious minutes and hours with the help of Grob's exclusive principle of Band Saw set-up.

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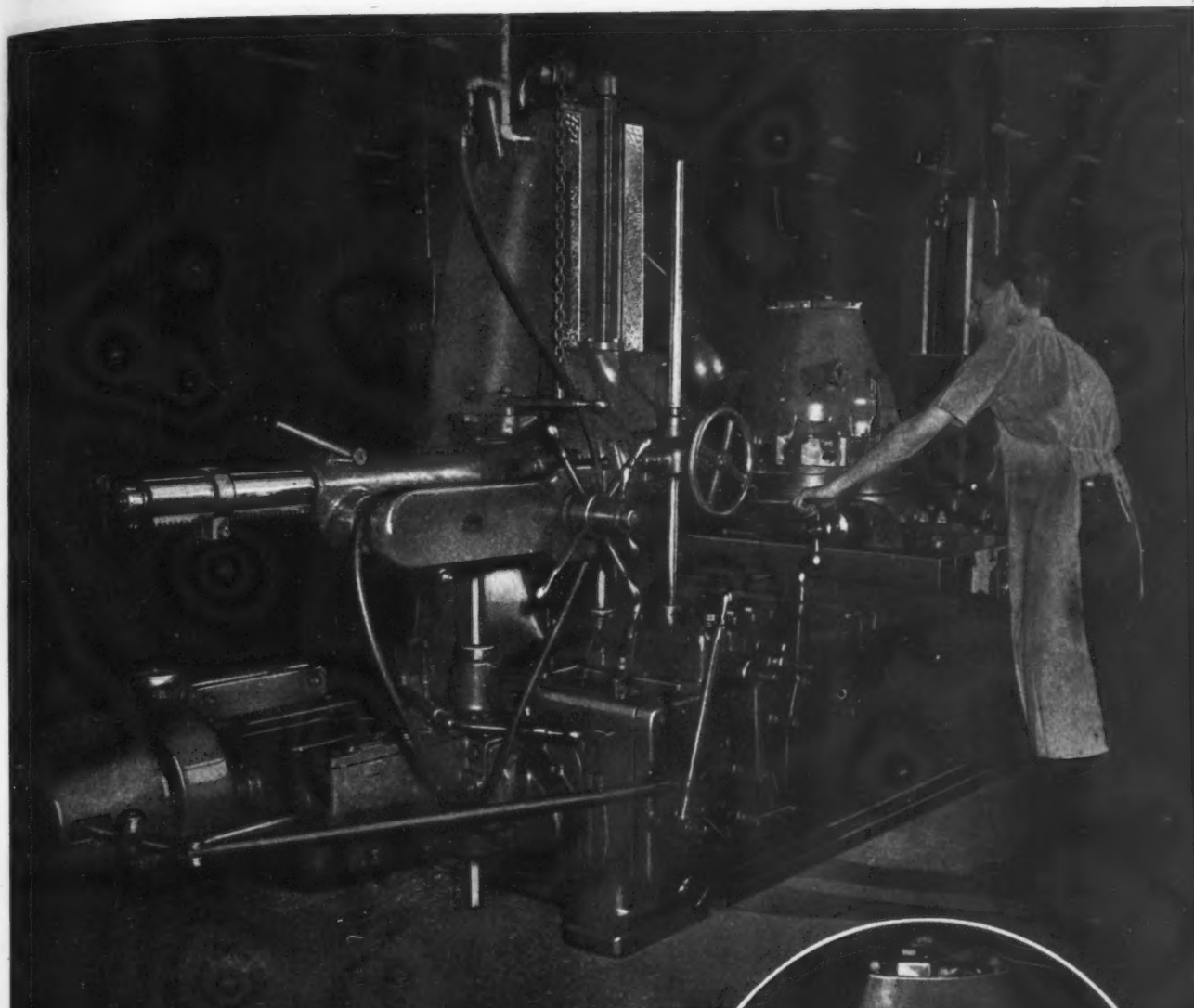
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*Precision Boring*

**WRIGHT "CYCLONE 18"  
NOSE SECTIONS**

**ON THE LUCAS HORIZONTAL  
BORING, DRILLING AND MILLING MACHINE**



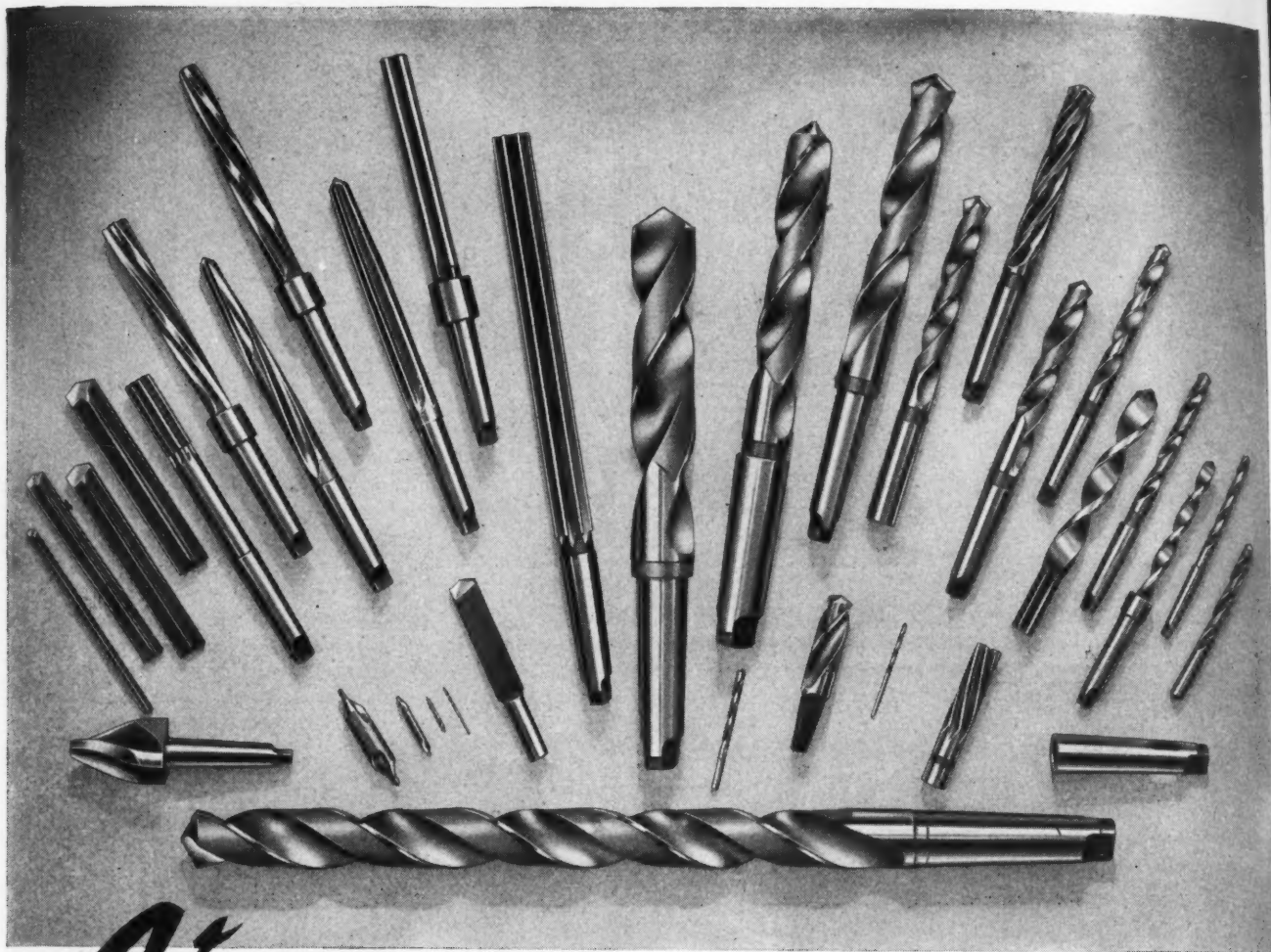
Here's precision-boring in action! The manufacture of Wright Aircraft Engines obviously requires ultra-precision at many stages of production . . . in the insert is a close-up of one of those stages: precision-boring in the nose section for a "Cyclone 18" as performed at the Wright Aeronautical Corporation plant in Paterson. The photograph above clearly identifies the Machine: the Lucas No. 41 "Precision" Horizontal Boring, Drilling and Milling Machine.

This is but one of numerous applications of Lucas "Precision" Horizontal Boring, Drilling and Milling

Machines to the mass-production of aircraft parts. These Machines are ideally fitted for the high quality of work demanded of the aircraft industry . . . their features assure speed of operation, convenience in control, a wide choice of speeds and feeds to suit a large variety of jobs, and above all, supreme accuracy.

For your work, requiring "aircraft" quality precision, consider LUCAS. Write for full details on the Lucas line of "Precision" Horizontal Boring, Drilling and Milling Machines.

**THE LUCAS MACHINE TOOL CO., 523 E. 99th ST. at N.Y.C.R.R., CLEVELAND, O.**



# *Victory* IS BUILT INTO THEM

**T**HESE are the seasoned disciplined, shock troops, the spearheads of attack in the constant war on costs—these Celfor Reamers and highspeed Twist Drills.

Two good examples of the victorious quality built into Celfor tools are the Celfor Type B Reamer—made only by Clark; and Celfor high speed Twist Drills, forged to shape, then twisted while hot to densify the metal for greatest durability. The Celfor process preserves and increases the inherent strength and toughness of finest tool steels—produces tools that can not be excelled for strength and cutting qualities.

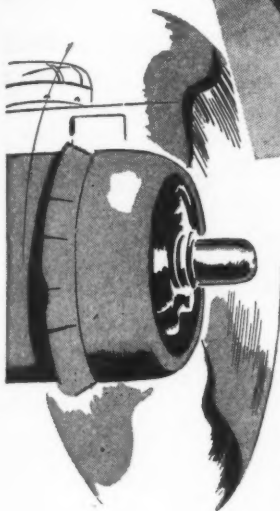


Take this simple, victorious step toward savings in man-hours, longer tool life and lower tool costs: send for the facts about Celfor Drills and Reamers.

**CLARK EQUIPMENT COMPANY**  
BUCHANAN, MICHIGAN

OTHER CLARK PRODUCTS — AXLES (Front and Rear) FOR TRUCKS AND BUSES • AXLE HOUSINGS • TRANSMISSIONS • METAL SPOKE WHEELS  
ELECTRIC STEEL CASTINGS • GEARS AND FORGINGS • RAILWAY CAR TRUCKS • BLIND RIVETS • INDUSTRIAL TRUCKS AND TRACTORS





## Presteel Aluminum Domes from Discs 0.450" Thick

Formerly hot forged of duraluminum alloy, these propellor hub domes are now cold formed from the new aluminum alloy No. 61, in massive Presteel presses. This progressive development, permitting the use of thinner walls, has resulted in aluminum savings up to 16 pounds per dome in some sizes — a huge amount on the total production. These cold formed domes have high ten-

sile strength and a greater resistance to corrosion than the former product. Stamping to tolerances of thousandths of an inch or less is every-day performance at Worcester Pressed Steel Company. And more and more manufacturers are turning to Presteel for lower costs and better production. Have you investigated Presteel possibilities for your own products? Mail samples or prints to —

**WORCESTER PRESSED STEEL CO.**



308 Barber Avenue, Worcester 6, Mass.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

MACHINERY, August, 1944—391

# UNSKILLED MEN or WOMEN

can turn out **FAST,**  
**ACCURATE TAPPING**  
for you

with this

**Ettco-Emrick**  
FOOT-OPERATED  
**TAPPING  
MACHINE**

With only brief instruction, any man or woman of ordinary intelligence can do a fast, accurate tapping job on this machine. Here's why. All the operator has to do is feed the work and step on the pedal. The machine does the actual tapping independently of the operator. The necessary sensitivity, accuracy and tapping speed are all provided by the machine's exclusive features, perfected by Ettco-Emrick as a result of more than 25 years of specialization in machine tapping.

Foot operation leaves both hands free for faster feeding and the entire mechanism is so delicately balanced that the pedal works as easily as a car's accelerator.

With the standard 2-spindle head, production up to 2400 accurately tapped holes per hour can readily be maintained—and up to 12,000 per hour with available Ettco-Emrick Multiple Spindle Heads.

➔ GET FULL DETAILS IN  
THESE BULLETINS

## BULLETIN No. 4

Covers the Tapping Machine

## BULLETIN No. 3

Covers the Multiple Heads

Copies mailed to you on request.  
Write for them today.

### IMPORTANT

Our recommendations as to correct taps, parts handling methods and work holders for specific jobs are always available to Ettco-Emrick tapping equipment users.

## ETTCO TOOL CO.

592 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1 • Chicago 6

The Famous  
**Ettco-Emrick** DRILL CHUCKS • TAP HOLDING CHUCKS  
TAPPING ATTACHMENTS • TAPPING MACHINES  
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS  
Unexcelled for Design, Materials and Workmanship

392—MACHINERY, August, 1944



THEY WORK AROUND THE CORNERS

**MILLER**

**FLEXIBLE DRIVE SOCKET SET**

**FLEXIBLE SCREW DRIVER**

Shaft of Laminated Steel Wire, not a Coiled Spring.  
U. S. Pat. 2,023,693

**MILLER FLEXIBLE SCREW DRIVER**—A practical, durable screw driver that actually "works around corners." One of the most valuable small tools ever put into a shop. Saves loss of time and temper on jobs in awkward places that can't be reached by a straight or offset driver. Laminated steel shaft; specially hardened screw driver bit. Shock-proof handle. Length overall 8". Price, 85c.

Efficient in production and assembling operations or for servicing small machines

**MILLER FLEXIBLE DRIVE SOCKET SET**—Same construction as Screw Driver. Set contains 6 Hex Sockets from 3/16" to 1/2" and flexible drive 10" long. All packed in handy metal box. Price, \$3.00.

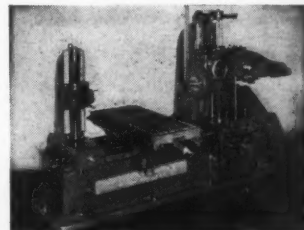
You'll wonder how you ever got along without it.

OBTAINABLE UNDER OMP-5—MRO.  
**L. B. MILLER COMPANY**  
BROOKLYN, N. Y.  
2120 AVENUE U

## UNIVERSAL Horizontal Boring Machine

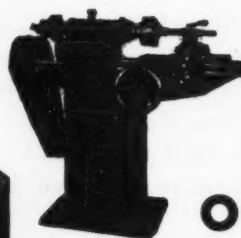
The only **TRIWAY** Boring Machine Built

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

**UNIVERSAL BORING MACHINE CO.**  
Hudson, Mass., U. S. A.



## FIND OUT More About This Versatile OIL GROOVER

Cut costs and speed production on oil grooving operations! Let us show you how the Fischer Oil Groover can be used to produce internal or external, straight or spiral grooves on work up to 15" in length. Put hitherto difficult jobs on a high production basis with its high speed chucking attachment. Write for bulletin giving complete details and specifications. **PROMPT DELIVERY!**

**FISCHER MACHINE CO.**  
310 N. ELEVENTH ST. PHILADELPHIA 7, PA.

# THE *Carbide* AGE

INVADING NEW FIELDS, WITH NEW METHODS IN MACHINING OF METALS  
SLASHING COSTS—SETTING UNDREAMED-OF PRODUCTION RECORDS!

Here's one of many examples of revolutionary progress being recorded daily by **WESSON Carbide Cutting Tools**.

*Formerly* . . . difficult form-slotting on an extremely hard tough molybdenum steel connecting rod (S. A. E. 6412, testing "40 Rockwell C") . . . required 4 operations and 13 minutes.

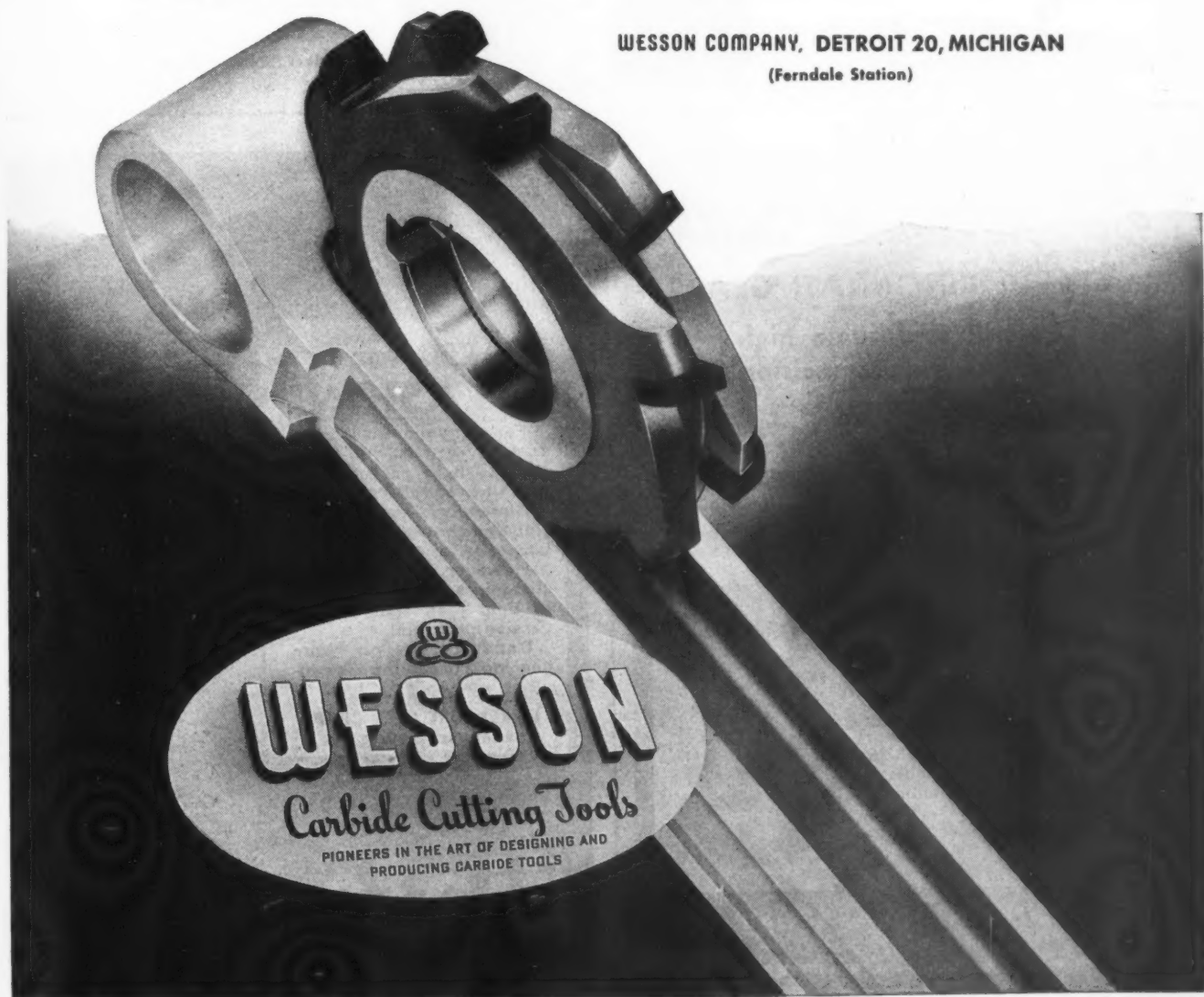
*Now* . . . **WESSON**-designed Carbide Form-Interlocking-Milling Cutters with new "negative rake and helix angles" and a special type of carbide, finish the same job in **ONE** operation and in only **ONE** minute! The **WESSON** method eliminates

two milling operations and one precision grinding, formerly done by 35 special grinding machines, each costing \$6000.00. The saving, 24 minutes per rod . . . and 105 highly skilled operators are now released for other vital work!

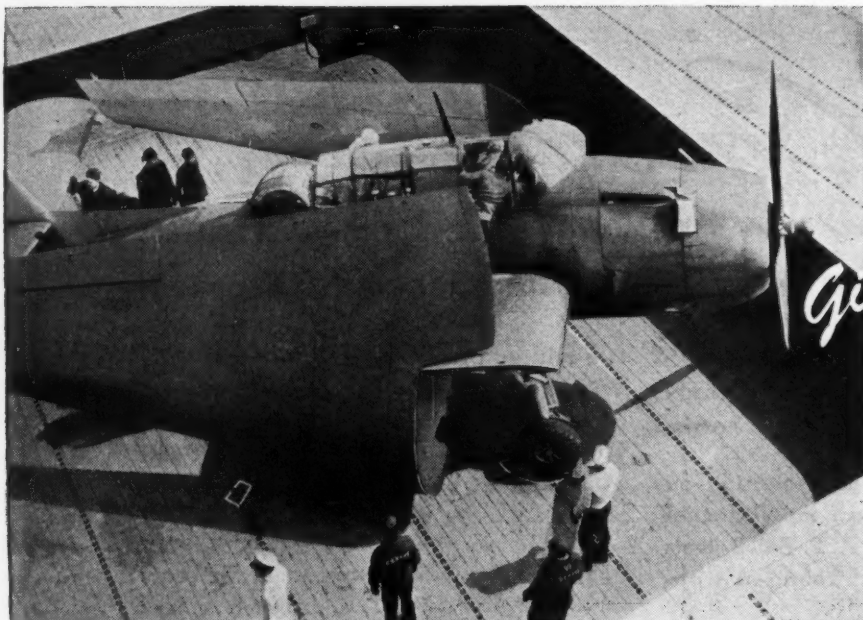
Simpler, faster production . . . lower costs . . . higher precision . . . finer finish . . . less tool grinding and resharpening . . . longer tool life . . . production **COSTS** cut way down . . . and the **VOLUME** stepped way up.

It's simple to convert to **WESSON Carbide Tools**. Wesson tool engineers are ready to assist you. . . . Phone, wire or write

**WESSON COMPANY, DETROIT 20, MICHIGAN**  
(Ferndale Station)







OFFICIAL U. S. NAVY PHOTO

*Giving our Planes  
a "LIFT"*

Earle Gears are used in the operating machinery on aeroplane carriers to elevate fighter planes from hangar to flight deck—as well as for submarine capstans, steering engines, anti-aircraft guns, boat cranes, etc.—Earle Gears pour forth in an endless stream for America's fighting equipment. Earle Gears in war-time service are living up to their peace-

time record for accuracy and dependability. For more than 40 years, Earle has specialized in designing and cutting spur, bevel, ring, miter, worm, herringbone and other types of gears for every branch of industry in all practical materials from 1/2" to 30 feet in diameter. Write for Bulletin 42-B.

**The EARLE GEAR & MACHINE CO.** 4709 STENTON AVENUE PHILADELPHIA 44, PA.



**SALES OFFICES:**

149 Broadway, New York 6, N. Y.

901 Davis Avenue, Pittsburgh 12, Pa.

## For A Sweet Tooth

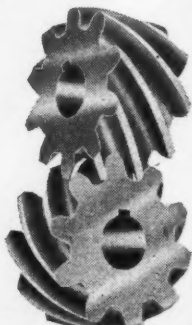
... look to CINCINNATI GEARS

You will find them high  
in accuracy and precision

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

Cincinnati Gears are precision gears. Through the use of many modern, newly designed tools and test instruments, skilled Cincinnati Gear craftsmen have set remarkable records for exactness and control.

Our forty years of experience and "KNOW HOW" may help you in solving your gear problem. We welcome an opportunity of proving to you the value of Gears ... Good Gears Only.



**THE CINCINNATI GEAR COMPANY**

"Gears... Good Gears Only"

Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

## GEARED for INVASION

For many months Diefendorf devoted its full facilities to help get our war machine ready for "D" Day.

Diefendorf Gear will continue on the war job—until victory.

However, many of our customers have asked us to help plan their reconversion program.

Consultation on your gearing problems is invited, now.

**DIEFENDORF GEAR CORP.**  
SYRACUSE, NEW YORK

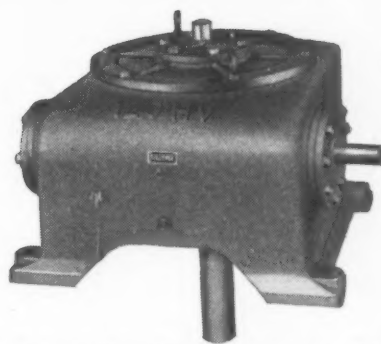


**diefendorf**  
★★★★★ **GEARS**

# GEARS . . . SHIPS . . . AND MEN

Old LST Number 385 has plowed into the beach to deliver essential war materiel to the doughboys that are fighting to hold the beachhead. . . . She's got her nose deep in the sand and must quickly back out for more "stuff" that'll help our G-I's in their battle with the enemy. . . . This back-out is easily done with the aid of a D. O. James 120 HV Worm Gear Reducer that is attached to the winch that pulls on the anchor —"heave-ho my hearties and off she floats"—another successful episode in the history of D. O. James Gears and Gear Reducers.

Since 1888 we have been privileged with many opportunities of solving the power-saving problems of American industry . . . and now with such varied war time requirements the D. O. James line of Gear Speed Reducers of every type will prove an aid to you in the solution of your power-saving problems.



D. O. James Worm Gear Reducers are available in 26 sizes with a ratio range of 6 to 65:1 and from 1/32 to 150 horsepower. Either horizontal or vertical drive and in the Standard Reducer or Motorized.

Established  
1888

# D. O. James

56 YEARS MAKERS OF

EVERY TYPE OF GEAR AND GEAR REDUCER



D. O. JAMES MANUFACTURING CO., 1140 WEST MONROE STREET, CHICAGO 7, ILL.

MACHINERY, August, 1944—395

## GOOD LOOKING

AND  
LOOKS  
ARE NOT  
DECEIVING



"THEY LIVE ON THE JOB"

**Massachusetts Gear & Tool Company**

34 Nashua St.

Woburn, Mass.

Mass  Gears  
HAVE THE  
QUALITY  
AND  
ACCURACY  
REQUIRED



### FOR YOUR SLOW SPEED MACHINES

There Are 11 Sizes of this particular style of worm gear speed reducer, which can be furnished with JANETTE motors of from  $\frac{1}{8}$  to  $7\frac{1}{2}$  H.P., and output speeds of .08 to 447 r.p.m.

As this style reducer can be furnished with foot or flange bases and assembled in 12 different mounting positions, it can be easily installed without special adapters on almost any slow speed machine.

WRITE TODAY for your copy of our catalog—100 pages of complete information on 47 styles and sizes of speed reducers.

**Janette Manufacturing Company**  
556 W. Monroe St. Chicago 6, Ill.

## CUT GEARS

All Types and Sizes

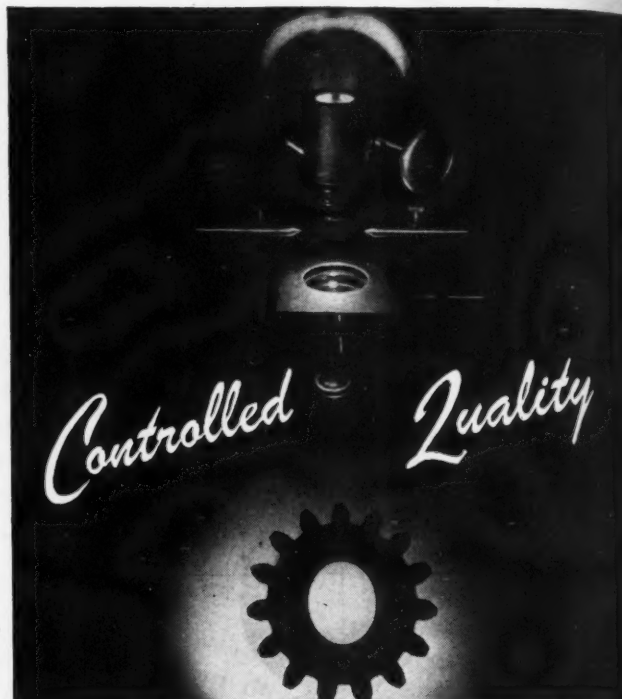
Baldwin Roller Chain and Sprockets

Heat Treated Alloy Steel Gears to  
Customer's Specifications

Special Gears and Special Gear Units

**PITTSBURGH GEAR & MACHINE CO.**

27th and Smallman Sts., Pittsburgh, Pa.



*Controlled Quality*

Precision gears cut to your specifications on the most modern machines. Any type and any size from  $\frac{5}{16}$ " to 16".

**DETROIT BEVEL GEAR CO.**  
8136 JOSEPH CAMPAU AVE. • DETROIT 11, MICH.  
*Makers of Quality Gears for 30 Years*

## GANSCHOW GEARS

FOR SIXTY YEARS

Spur—**SPEED REDUCERS**—Worm

ALL TYPES OF CUT GEARS

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SEND US YOUR PRINTS FOR *Quotations*

**GEAR SPECIALIST—BROACHING  
THREAD GRINDING**

 **TAYLOR MACHINE Co.**  
1917 EAST 61ST ST. • CLEVELAND 3, Ohio





*Precision* **GEARS**

being toughened

*by exact*

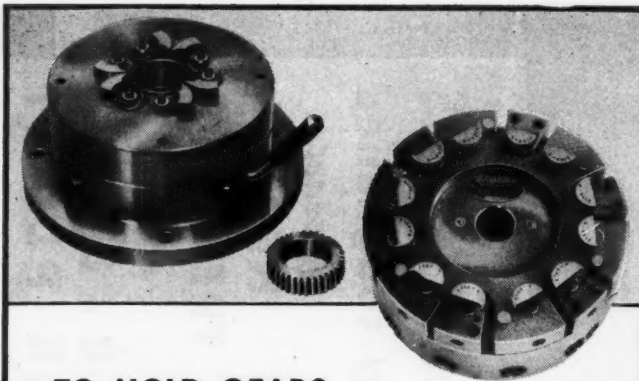
**HEAT**

**TREATING**

*at the*

**S I E R - B A T H  
G E A R P L A N T**

Send your Specifications for quotations to the SIER-BATH GEAR CO., North Bergen, N. J.



### TO HOLD GEARS

with precision for boring or grinding  
HAVE TEETH GRIPPED ON LINE OF ACTION

*Principle used only in*

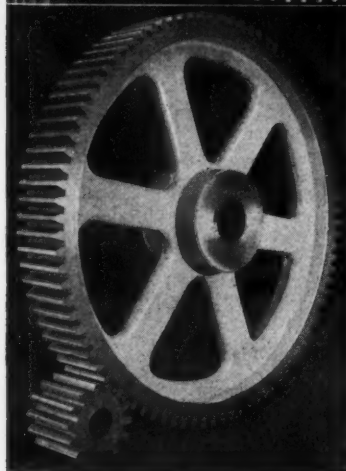
## MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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**LeMaire Tool & Manufacturing Co.**

2671 So. Telegraph Rd., Dearborn, Mich.



SPURS, SPIRALS, BEVELS,  
RACKS, WORMS... ANY  
SIZE... ANY QUANTITY

*We're Proud*  
OF THIS  
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Big gears are not unusual in the Stahl plant; in fact, we are specialists in the manufacture of extra large spurs, spirals, bevels and racks. We're proud of this job, not because of its size, but because its exceptional precision reflects the skill and care we put into every order for gears, no matter what the size, material, type or quantity.

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## "GRANT"

Represents three things to gear users—quality, speed, economy.

GRANT GEARS have a world-wide reputation. Accuracy, durability and dependability gained by experience of over sixty years.

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## GEARS IN A HURRY?

Don't risk hold-up of vital war production—get any type or size of gear, *quickly*, from Atlantic. Wide stock of standard gears... gears cut to your specifications... repair work, too. Phone, write or wire Atlantic!

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GEAR WORKS, INCORPORATED  
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**ALL TYPES OF GEARS**

Any Material  
Any Quantity  
Any Size

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**QUARTER CENTURY**  
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Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH

*All Gears certified for Accuracy  
Quality and Fine Workmanship*

**NEW JERSEY GEAR & MFG. CO.**  
406 Stanton St. Newark, N. J.

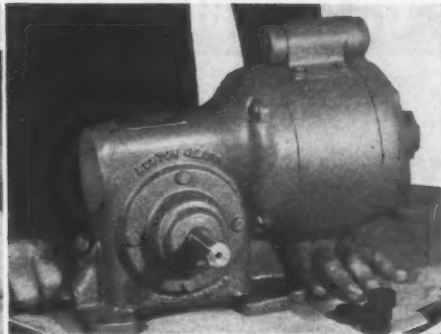
# MOTORIZED SPEED REDUCERS



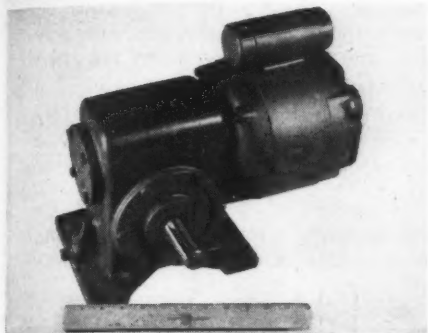
$\frac{1}{20}$  HORSEPOWER



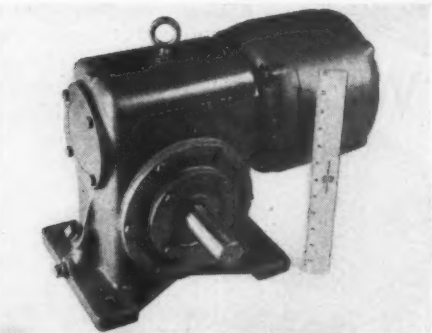
$\frac{1}{2}$  HORSEPOWER



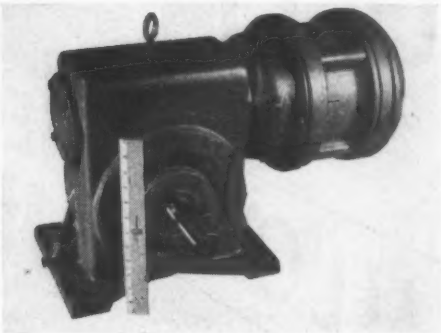
$\frac{1}{4}$  and  $\frac{1}{3}$  HORSEPOWER



$\frac{1}{2}$  and  $\frac{3}{4}$  HORSEPOWER



$\frac{1}{2}$ ,  $\frac{3}{4}$  and 1 HORSEPOWER



1,  $1\frac{1}{2}$ , 2 and 3 HORSEPOWER

Boston Gear Ratiomotors\* (motorized speed reducers) are equipped as standard with General Electric or Westinghouse motors and are available in sizes ranging from 1/20 to 3 horsepower and in output speeds of 17.9 to 460 R.P.M. Complete specifications and prices of these products can be obtained from the following authorized distributors and direct company branches, any of whom will be glad to assist you in reaching a satisfactory solution of your speed reduction problem.



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...IN MANY DIFFERENT  
APPLICATIONS

"OUTWEARS THE BEST  
BRONZE METAL"

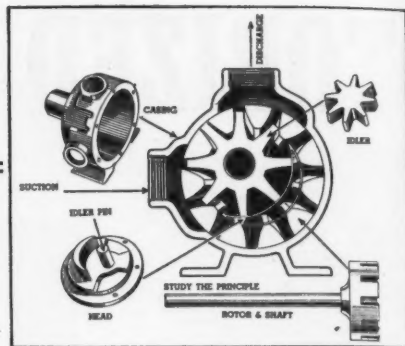


## ARGUTO OILLESS BEARING CO.

WAYNE JUNCTION

PHILADELPHIA

400—MACHINERY, August, 1944



**That's All There Is . . .  
THERE ISN'T ANY MORE!**

Extremely simple in design, yet exceptionally sturdy in construction, Viking Rotary Pumps operate on the famous "gear within a gear" principle, with only four major parts and with **ONLY TWO MOVING PARTS**, as illustrated here. It's easy to understand why Vikings have won leadership in the rotary pump field. Viking Pumps give dependable service with a minimum of wear.



Write today for Bulletin 1100 which gives complete information about Viking Pumps widely used today in the machine tool industry. **IT'S FREE.**

**VIKING Pump COMPANY**  
CEDAR FALLS IOWA

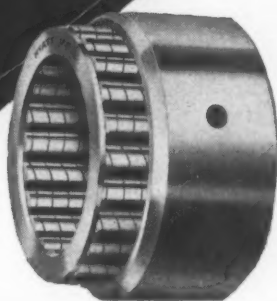
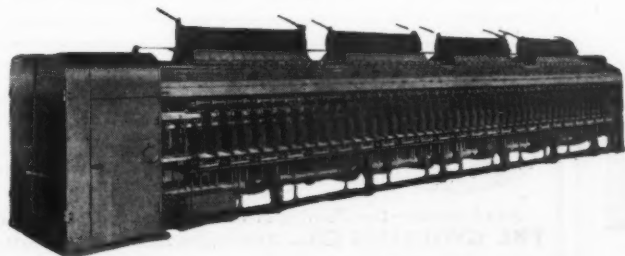
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*For the Duration, We Are Unable  
to Supply Waterbury  
Steel Balls*

THE WATERBURY STEEL BALL CO., INC.  
U. S. A.  
MAIN OFFICE: POUGHKEEPSIE, N. Y.



HERE IS A CYLINDER ARBOR BEARING that is as simple as a babbitt bearing. Alloy steel rollers and hardened and ground steel race merely supplant the babbitt. The rollers run directly on the shaft which has been hardened and ground. The surface of this arbor where the rollers run is as hard as the bearing outer sleeve and will not wear. Hardening the shaft strengthens it, and the rollers provide greater capacity; they do not wear as fast—yet they have a lower coefficient of friction. Power is saved and oil is saved. Frames are kept cleaner because oil does not leak out on floors and tapes.



#### TO ALL MACHINE DESIGNERS:

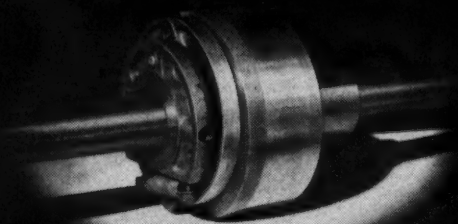
*In this textile application we show only one of the many ways Hyatt Roller Bearings help refine design. Maximum capacity in small diameters, simple machining, no press fits, no locking collars. Other types of Hyatts in the solid roller series are also available for other applications. Let us help solve your anti-friction bearing problems.*

#### HYATT BEARINGS Division

GENERAL MOTORS CORPORATION  
HARRISON, NEW JERSEY

MACHINERY, August, 1944—401

★ ★ THE HILLIARD ★ ★



## SINGLE REVOLUTION *Clutch*

*W*herever extremely accurate control of intermittent machine operation is essential the Hilliard Single Revolution Clutch is unequalled. Its accuracy has won for it the acceptance of Industry for cutting, punching and packaging operations.

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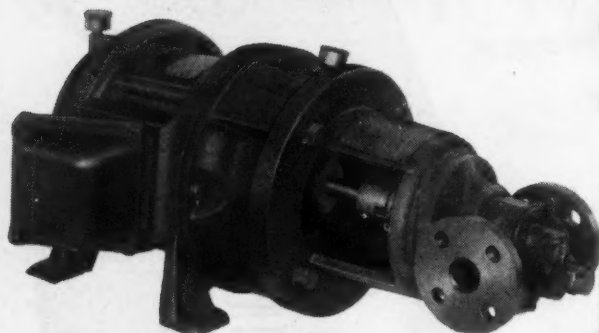
For information that will help you to adapt this clutch to your needs.

**THE HILLIARD Corporation**

115 WEST 4TH ST. ELMIRA, N. Y.

★ OVER-RUNNING SLIP CENTRIFUGAL FRICTION ★

## SEA DUTY—



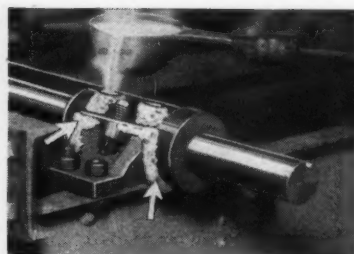
**B&S**

This Brown & Sharpe special unit pumps lubricating oil to purifiers for engines in navy vessels. Similar pumps used, also, for fuel oil supply.

Such units have advantages in compactness and mounting. Furnished, also, for dual service with pump on each end of motor. Pump catalog sent upon request. Brown & Sharpe Mfg. Co., Providence, R. I.

GEARED—VANE—CENTRIFUGAL—MOTOR DRIVEN

# BROWN & SHARPE PUMPS



## NO BLOWOUTS!

**Babbittite Prevents Injury From Molten Metal**

- Babbittite contains no moisture, does not generate steam when in contact with hot molten metal.
- Babbittite's strength of body gives it greater capacity to hold a charge of hot molten metal.
- Babbittite adheres tightly to the mold or metal, under all working conditions.
- Babbittite does not melt and allow Babbitt metal to run out, regardless of pouring temperature.
- Babbittite does not dry out or harden, yet remains moisture-free.
- Babbittite is ready-for-use, requires no mixing, may be re-used over 100 times.

Write for Liberal Sample.

**Babbittite**  
THE BABBIT RETAINER

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Glass and  
unbreakable types  
for every application.

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Strictly Modern Equipment, Backed by the Skill and Judgment of 30 Years Experience. Also, We Sell "Heat-Easy" Compound for Pack Hardening High Speed and High Carbon—High Chrome Steels.

THE BENNETT METAL TREATING COMPANY, Elmwood, Conn.

## Heavy Duty Thrust Bearings



STANDARD SIZES or  
SPECIAL DESIGN to  
your specifications.  
Send sketch or sample  
for quotation—without  
obligation.

Any Quantity—One Bearing or Many. Catalog Upon Request.  
**THE GWILLIAM CO., 360 Furman St., Brooklyn, N. Y.**



# GREATLY REDUCES *Bearing Wear and Replacements* . . . yet it is as SIMPLE as ABC . . .



**A** all radial loads carried at right angles to the roller axis

**B** all thrust loads carried at right angles to the roller axis

**C** no oblique components to complicate radial and thrust pressures.

## with **ROLLWAY** RIGHT-ANGLED LOADING

Costs pared to the bone! That will be the production slogan after the war. And right now—with new designs on your boards—is the time to think about new, longer-wearing or higher-capacity bearings . . . both for your production machinery, and for the products you make. Find out how Rollway's Right-Angled Bearing Loading will simplify the loads. How it will permit smaller housings, heavier pressures, or longer bearing life—even proportionate combinations of all three.

### Rollway Splits the Load, Reduces the Pressures

Because Rollway Roller Bearings are always loaded at right angles to the roller axis, only one load component—either pure radial or pure thrust—can bear upon the rollers. That means reduced load pressures within easily computed limits, greater resistance to shock, oscillating or vibrating loads, and to overloads. No oblique components can raise the stresses above the elastic limits. You know the simple forces you are dealing with, and you can provide for them adequately.

### SAE and American Standard Metric Sizes

Rollway has developed many variations of its solid cylindrical roller bearings in SAE and American Standard metric sizes, each having definite characteristics to meet exacting needs.

Let us help you to take full advantage of this wide choice of types and sizes. Just send us your design, or a detailed description for free, confidential analysis. No obligation.



For compound loads, SEPARATE radial and thrust bearings are used in combination as per diagram.

# ROLLWAY

BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908

# BEARINGS

ARE YOUR EMPLOYEES  
SKATING IN OIL?



## End the danger quickly with SPEEDI-DRI

A BLEEDING, oil-soaked floor makes a great skating-rink, but it's dangerous to life and limb, it slows production, and it's a serious fire-hazard. SPEEDI-DRI is your best answer. This light-reflecting, granular, oil- and grease-absorbent acts as a poultice for sick, slick floors, soaking up fresh oil rapidly and even drawing out old deposits until your floors are like new. The minute it's spread, it provides a non-skid footing that prevents many a slipping accident. What's more, it's fire-retardant! Easily spread and cleaned-up without interrupting production, it saves hours of porter-labor. SPEEDI-DRI has many other uses in industry, too. Write for literature and FREE SAMPLE—today!

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Midwest & South—Waverly Petroleum Products Co., Philadelphia 6, Pa.  
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**SPEEDI-DRI**  
OIL AND GREASE ABSORBENT



## Bearings

for  
Present  
or  
Post-war  
Plans

Let us work out with your engineer the design, application and service of any type anti-friction bearing on which you may need specialized advice. Our research into the operation and performance of bearings—their stress, load and service conditions—qualifies us to be helpful to you in governing your design of ball and roller bearings. Thirty-two years engineering experience in the making of high quality, smooth precision, heavy duty, special design and standard bearings over 100 MM. O.D.

*Write or phone for new Catalog giving full particulars.*

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## FLEXIBLE COUPLINGS

### SMOOTH POWER!

Correct for misalignment, absorb shock, vibration, whip, chatter. Protect machines.

**L-R TYPE "HQ" FREE FLOATING CUSHIONS EASILY DISCONNECTED FOR TIMING**

Pat. and Pats. Pend.

**NON-LUBRICATED**

Send for Catalog and quick-finding Selector Charts.

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Eliminate lost time handling raw materials, castings, work in progress, finished parts. Lift and carry with Morgan Cranes everywhere in the shop. Write for details, sizes, prices.

**MORGAN ENGINEERING CO. Alliance, O.**

# CRANES

*Smooth Planing...*

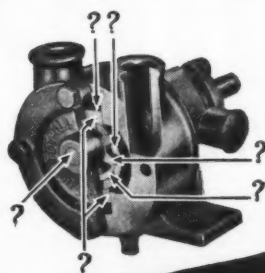
## NO CHATTER!

### With Red-E Style K SHAPER AND PLANNER TOOL



This Planer Tool will take perfectly smooth and heavier cuts with absolutely no chatter—because cutting point is on the line of deflection, and any springing of the tool takes it AWAY from the work, not deeper into it. Standard square High Speed Steel treated tool bits are used. Write for bulletin and prices.

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550 Iranistan Ave. Bridgeport, Conn.



**TUTHILL'S COOLANT PUMP**  
OFFERS "Secret Weapons"  
AGAINST CHIPS AND GRIT

Write today for full information on the internal-gear rotary Tuthill Coolant Pump with the built-in automatic by-pass that laughs at chips and grit. Sizes from 1 to 50 g.p.m. Ask for Model M bulletin.

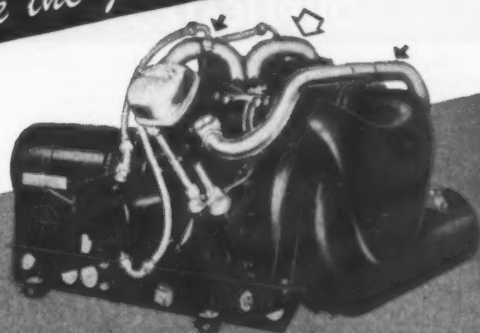


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SERVING ARMY  
NAVY • AIR FORCE  
MERCHANT MARINE

**TUTHILL PUMP COMPANY**  
939 E. 95th ST. • CHICAGO 19, ILLINOIS

*Where the going gets HOT*



*Put the job up to this*

### WELDED STAINLESS TUBING

When it comes to exhaust bends and collector rings there are qualities in Carpenter Welded Stainless Tubing that should not be overlooked in their design and manufacture.

#### HEAT RESISTANT



Type 347 used in this application will not scale up to 1700° F.

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It stands up under severe corrosive conditions especially when high temperatures are encountered and welding is done in the fabrication.

#### EASY TO FABRICATE



It is sufficiently ductile to permit easy bending, flanging, expanding, etc.

#### LIGHTWEIGHT with STRENGTH



The uniform wall thickness of Welded Stainless Tubing allows use of lighter gauges without sacrificing strength.

#### SEND FOR ENGINEERING DATA

This convenient file folder will help you select the correct type of Welded Stainless Tubing for your needs. It contains data on physical properties, corrosion resistance, sizes and shapes available. Just drop us a line on your company letterhead.



#### THE CARPENTER STEEL COMPANY

Welded Alloy Tube Division • Kenilworth, N. J.

# Carpenter

## WELDED STAINLESS TUBING



# Metal Stampings

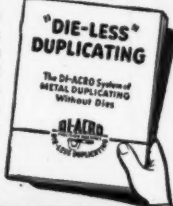
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If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.



← Pronounced "DIE-ACK-RO"

**O'NEIL-IRWIN MFG. CO.**



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"DIE-LESS DUPLICATING"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



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### SPECIFY Precision LATHE ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

For 10" Atlas & Logan, 9" South Bend 1/2" Capacity Lathes, etc.



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List \$45.00

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Order from your dealer or  
write us for literature.



HAND TYPE  
BREN  
Collet  
\$4.50 ea.

HAND  
DRAWBAR  
\$18.50

**Speedichuk**  
WITH THE Precision  
BREN COLLET

- Increases 1/2" collet capacity lathes to 3/4".
- Ready for instant use and interchangeable on any 1 1/2" x 8 thread spindle lathe... Atlas, Logan, 9" South Bend, Clausing, etc.
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- LEVER TYPE for continuous production. Feather pressure releases work while lathe is running. LIST \$79.50, Collet extra.
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**GENERAL DIE-STAMPING-TOOL COMPANY**

PRECISION COLLET DIVISION

262 Mott St., New York 12, N.Y.

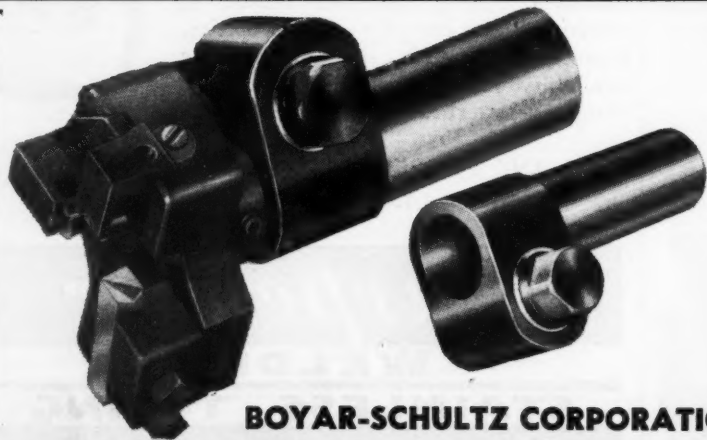


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## STEEL STAMPS

Speed wartime marking jobs with Thor Stamps. They are marked on the "thumb side" to prevent time lost through errors... They are deeply cut to produce clear, clean impressions... They are individually heat treated for maximum toughness. Look for the blue head and the name Thor on the stamps you buy for wartime marking jobs.

**THE PITTSBURGH STAMP COMPANY**  
810 Canal St., Pittsburgh, Pa.



### INCREASE THE CAPACITY of SCREW MACHINES with BOYAR-SCHULTZ Precision MODEL H ADAPTER

Built to last... a permanent Tool of special design, made with the same precision workmanship that has so long characterized other Boyar-Schultz Screw Machine Tools.

With this Model H Adapter, more than one size tool can be used on a screw machine of a given size, greatly increasing the machine's flexibility.

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## PRECISION-FABRICATED WIRE CLOTH UNIT-HANDLING FIXTURES

made to individual requirements

ALL METALS—ALL WEAVES—ALL SIZES—ALL SHAPES

for annealing, carburizing, brazing, cyaniding, dipping, hardening, heat-treating, materials-handling, nitriding, pickling, plating, quenching.

**The LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS**

NEWSTEAD AVENUE & WABASH R.R.

Manufacturers of

ZONE 10

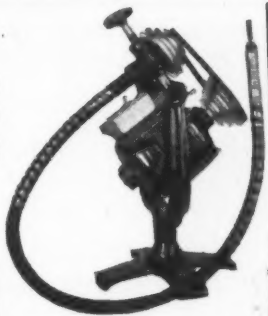
**"Perfect" WIRE CLOTHS and WOVEN WIRE SCREENS**

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Airplane and defense plants have found Lewis Machines entirely dependable during this War crisis.

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A Machine for every possible need.



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We manufacture a complete line of Rotary Files and Rasps with a large stock of all sizes and shapes.

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- Fastest, simplest way to number parts.
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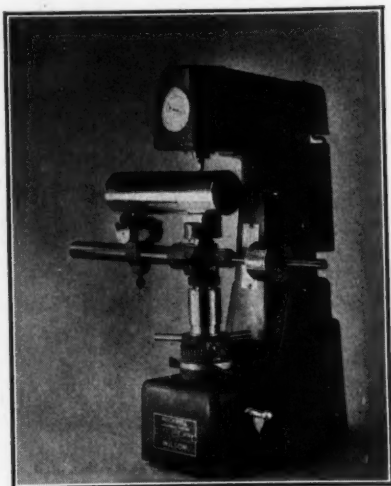
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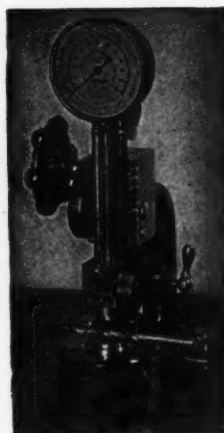
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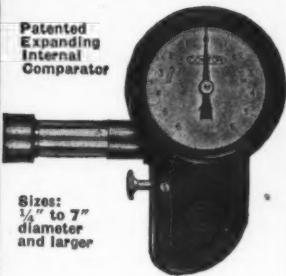
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results with  
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Sizes:  
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SINCE 1885**



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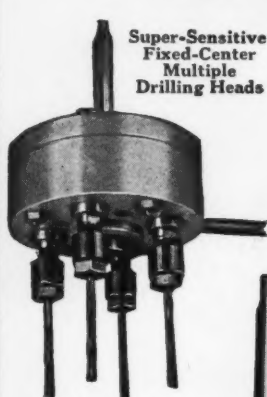
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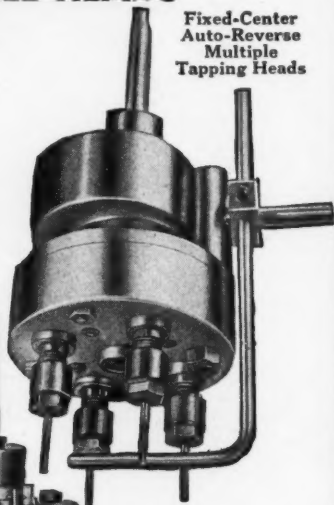
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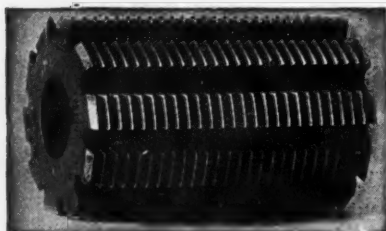
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All Parts  
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to Insure  
Pressure  
Lubrication  
and  
Rigid  
Support of  
Adjustable  
Spindles

ADJUSTABLE  
MULTIPLE  
SPINDLE  
DRILLING  
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INVOLUTE SPUR GEAR CUTTERS  
14½°; 20° and 25° P. A.

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PHONE 85

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Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORD-  
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Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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## COPPER HEAD LAPS

SAVE TOOL ROOM TIME . . .

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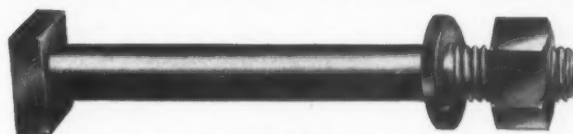
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Consider the tool room time saved when you use Copper Head Laps instead of making them in your own shop. That is not the only saving . . . Copper Head Laps never wear out. The only wearing part is the inexpensive copper sleeve. Adjustment feature permits maintaining correct lapping size till sleeve is worn. Machined heads and carefully cut threads sized sleeve.

Available from stock in Standard sizes—1/8" to 2 1/2".

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It Is **CHEAPER** To Use  
**GOOD BOLTS** Than To  
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Heat treated alloy steels make them **TOUGH** for heavy work. Machined heads and carefully cut threads make them **ACCURATE** for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

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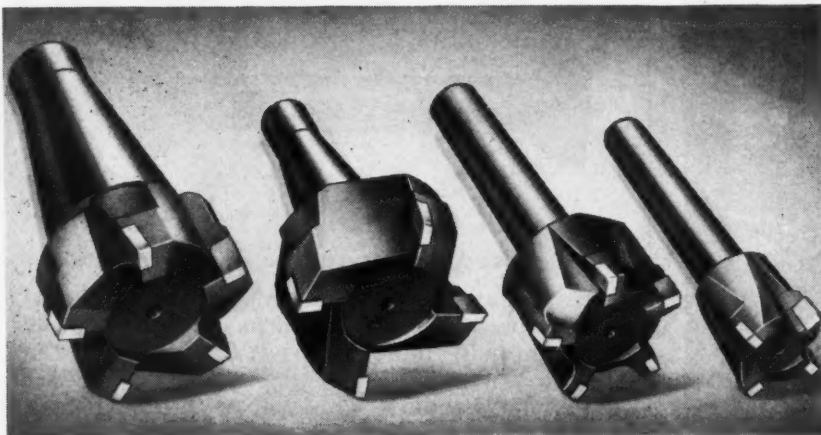


## ALLEN **FLAT HEAD** Cap Screws

They set up in a counterbored hole more truly flush than any other type of hollow screw. The V-head fits the counterbore with complete *closed contact* all-round. This gives frictional holding-power and rigidity of grip... "Pressur-formd" of ALLENOY steel, with uncut metal fibres shaped to the head. Threads also *pressur-formd*, with tolerance held to a high Class 3 fit. Obtainable as a part of the ALLEN Line from your local Industrial Distributor. Ask for samples and dimensional data.

The Allen Mfg. Company ★ **ALLEN** ★ Hartford, Conn., U. S. A.

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When war requirements give way to peace-time production, manufacturers again face that all-but-forgotten bogey, competition. Successful competition means building at lower cost than ever before ... more work per man hour ... more production per cutter dollar.

When that day arrives, Cal-Cutters will lower peace-time manufacturing costs as well as they increase today's wartime production. Output from the same milling machines is even now being jumped from 5 to 15 times ... floor-to-floor time cut from 45 minutes per piece to 3 minutes per piece! Hundreds of records attest to Cal-Cutters' greater production ability.

If you need greater war production now or have an eye on the competitive future, remember—you can mill it faster, mill it better and mill it cheaper with carbide-tipped CAL-CUTTERS!





**MACHINERY MANUFACTURING COMPANY**  
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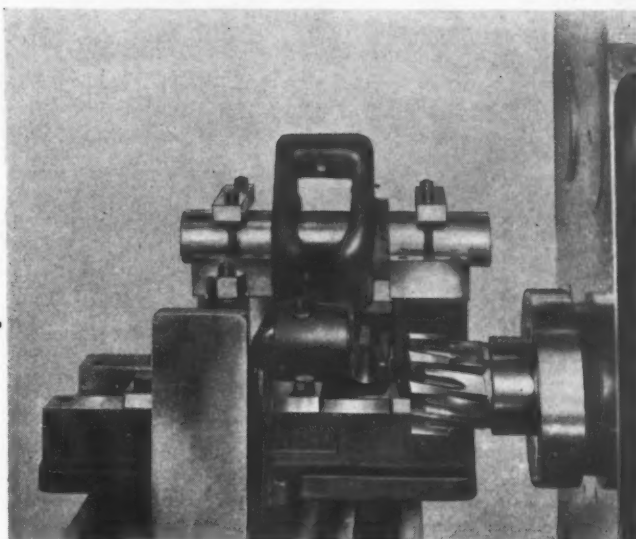
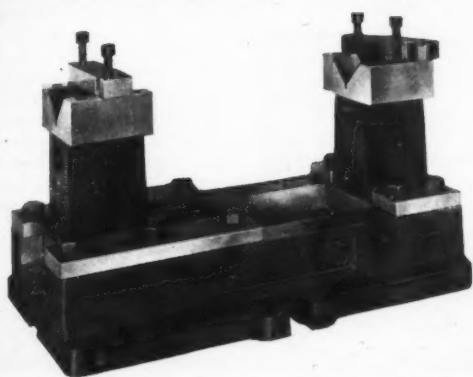
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# Speed your TOUGHEST SET-UPS

for • MILLING • DRILLING  
• BORING • INSPECTION

## WITH THE HARTFORD V-BLOCK FIXTURE



Many leading plants and machine shops are finding the Hartford V-Block Fixture the answer to difficulties in locating and holding irregular-shaped work for machining operations. ABOVE, set-up for milling cut being taken to square up end of casting. As this cut is taken from original setting, squareness to the holes is assured. Any other cuts or milling of pads can be completed at same time. Correctly hardened and accurately ground V-Blocks are adjustable in the scraped semi-steel base. Investigate its possibilities for YOUR work!

**The HARTFORD SPECIAL MACHINERY CO.**  
**HARTFORD 5, CONN.**

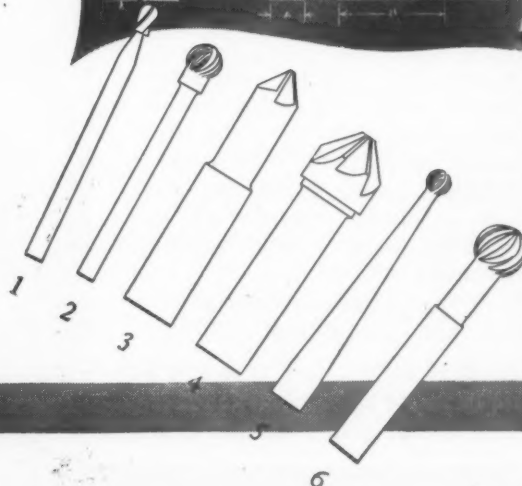
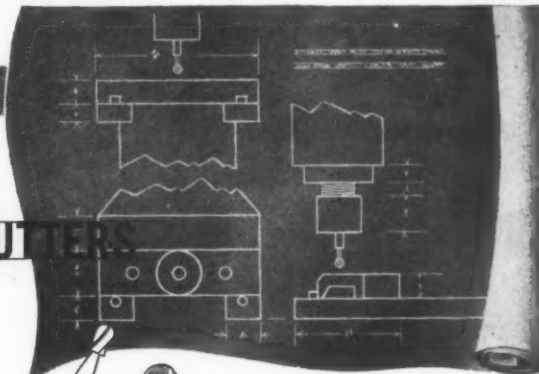
## TO YOUR SPECIFICATIONS

### *Carbide-tipped* ROTARY CUTTERS

We are now equipped to turn out custom-made CARBIDE Rotary Cutters to meet your most exact requirements—precision ground for precision performance. Send your sketches or blueprints to M. A. Ford Mfg. Co. Inc., 737 W. First St., Davenport, Ia. No obligation of course.

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- (4) Carbide chatterless countersink— $\frac{3}{8}$ " shank.
- (5) Carbide ball— $\frac{3}{16}$ " diam.  $\frac{1}{4}$ " shank,  $3\frac{3}{4}$ " overall length.
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Ask for your copy of catalog showing our standard line of Carbide Cutters.



# FORD

*The mark of a GOOD File*

# BIG or SMALL Consumers

They're All Equally Important



"Gentlemen:

"I must say I was surprised and pleased to receive your letter. Imagine a concern as large as yours asking for post-war business at the present time under the hardships which must confront you in the way of raw materials, etc. Yours is the only company which has written in regard to our business, small though it has been with you, and believe me when priority restrictions are lifted from inventory stocks, we look forward to having a complete stock of 'Stronghold' items."

(Signature upon request)

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SCREW PRODUCTS**  
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*Boring  
Heads*

**Original Accuracy  
Maintained**

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Lead  
Screw  
ground from  
Solid AFTER  
hardening.



**CRITERION MACHINE WORKS**  
BEVERLY HILLS, CALIFORNIA

*The BEST way to hold most work—  
The ONLY way to hold some of it*

**WALKER  
MAGNETIC CHUCKS**



★ For all-around versatility, Walker Magnetic Chucks can't be beat! They hold big, hard-to-handle work easily . . . grip fine, intricate work firmly and protect it against distortion. Above—No. 618 All-Steel Magnetic Chuck, available in sizes ranging from 4" x 8" up to 30" x 96". Left—Rotary Magnetic Chuck with Style B face plates—sizes from 4" to 66" dia. For data on complete line, write.

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Positioning Equipment  
SERVES AGAIN!

WRIGHT CYCLONE 3350 ENGINES used on the CONSTELLATION and other new, increased capacity planes are assembled and serviced on CLAYBORNE Stands.

Engineered and Matched Units for Complete Assembly and Overhaul of the Wright Cyclone Engine are illustrated at right... but there is CLAYBORNE Positioning Equipment for practically every type and size of aircraft engine, both radial and inline. Clayborne Portable Engine Stands are engineered for more efficient service.

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Model AC-21  
Front Section  
Crankcase Sub-  
Assembly Stand



Model AC-22  
Supercharger  
Rear Housing  
Sub-Assembly  
Stand



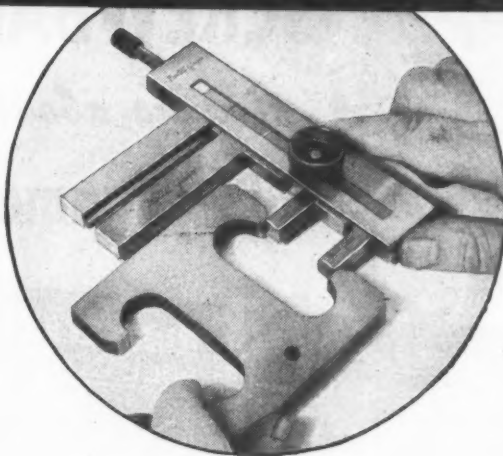
Model AC-12  
Cylinder  
Assembly and  
Servicing Stand



Model AC-24  
Final Assembly  
Stand. Engine is  
manufactured or  
maintained on  
test mount, elim-  
inating extra  
labor. The ring  
supporting test  
mount revolves on  
ball bearings.



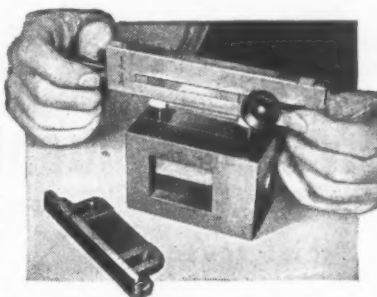
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Trammel points and scriber are only a few DoALL instruments. Used to lay out thousands of different radii of micro inch dimensions, also to check location of tiny holes, points, arcs, etc.



## DoALL GAGE BLOCKS



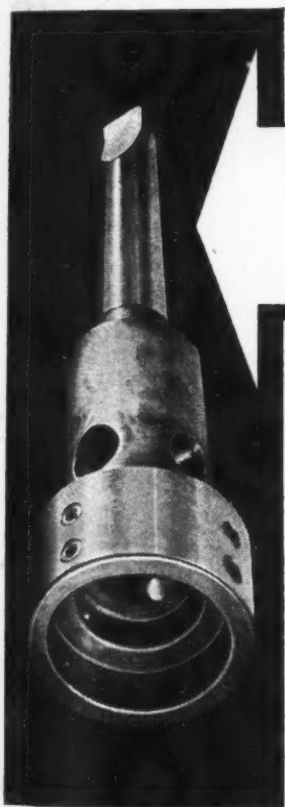
Set of 83 Blocks and 20 auxiliary instruments in a compact case will put your shop abreast of the best when it comes to designing, making and inspecting precision tools and interchangeable parts for war or peacetime equipment.

FREE Inspection Handbook. All about the use and care of Gage Blocks. Just ask for a copy of "Quality Control."

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Manufacturers of DoAll Contour Machines and Surface Grinders.  
Office in Principal Cities.

1312 S. Washington Ave., Minneapolis, Minn.

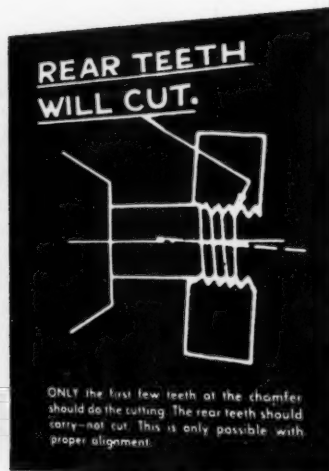
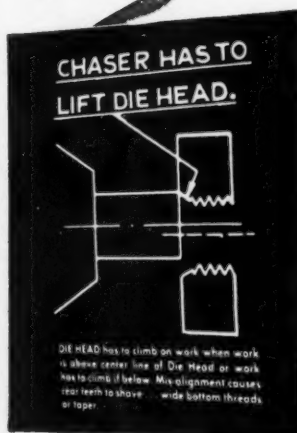


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This useful tool is needed in every machine shop. It's built to hold 1" or 1 1/2" O. D. button dies for chasing threads up to 3/8" x 3" in a lathe or drill press. Whether you have a single piece to thread or a quantity of them, you can do the work faster and better with the Rieger Die Holder. And you don't have to wait! We have on hand ready to ship immediately a supply of Model DH-1512-MT with No. 2 Morse taper shank. Write for literature and quotation.

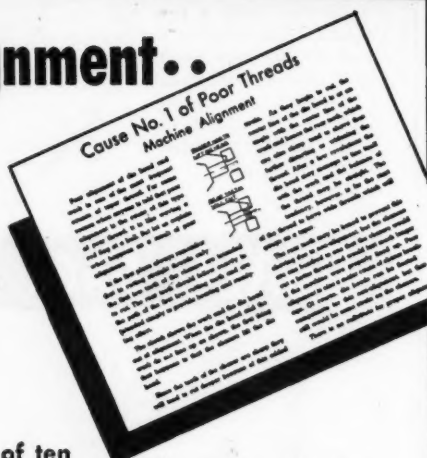
## THE RIEGER MFG. CO.

Dept. M-8 MIAMISBURG, OHIO



## MIS-alignment..

chief cause  
of  
taper threads



Seven times out of ten  
the cause of taper threads is machine out of  
alignment. This condition should be corrected at  
once to reduce rejections and give  
longer life to chasers.

FREE — Die Headlines Numbers 1 and 2 —

The causes of taper thread and correction of  
machine mis-alignment are discussed in detail in  
these issues which will be gladly sent upon  
request. Please use business letterhead.



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Manufacturers of H & G DIE HEADS • THREADED RODS • SCREW MACHINE PRODUCTS

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CANADIAN REPRESENTATIVES

F. F. BARBER MACHINERY CO., TORONTO, WINDSOR, MONTREAL

416—MACHINERY, August, 1944

# Redmer

AIR CHUCK

Accurately holds to depth at the same time it automatically centers parts for drilling, milling, tapping, etc. Needed in every plant where second operation work is done. Also for assembly or wherever a holding fixture to do precision operations is needed. Uses Brown and Sharpe type screw machine collets and simplifies "setting-up" operations and in most instances eliminates the making of jigs or fixtures. Has low consumption of air and its simplicity of construction eliminates expensive repairs.

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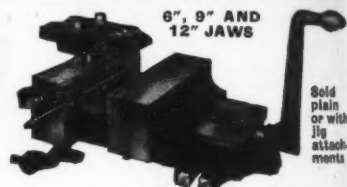
Literature on request.  
Write for Catalog Sheet.



**REDMER AIR DEVICES CORP.**  
609 W. WASHINGTON BLVD., CHICAGO 6, ILL.

## GRAHAM MULTI-PURPOSE VISE

124-lb. ruggedness for  
planer or shaper, or  
light-weight sizes for  
drill press.



The range of sizes suits Graham Vises to drill presses, planers, shapers, millers, radials, grinders, etc., while the variety of auxiliary attachments makes possible endless range of special-holding uses for irregular shapes, jig-drilling, repeat-operation work, etc.

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On Your Manufacturing Problems

## Gear Cutting Machines

Gear Specialists since 1900

**NEWARK GEAR CUTTING MACHINE CO.**

69 Prospect St., NEWARK 5, N. J.  
FRANK E. EBERHARDT, President



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 Gear Cutters . Reamers . Milling Cutters . Slitting  
 Saws . Circular and Flat Form Tools . Special Tools  
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## Metal Cutting Tools

that help in fabricating airplanes  
 should be characterized by . . .  
**PRECISION and DURABILITY.**  
 National Cleveland Tools are  
 known internationally for quality.

NATIONAL TOOLS ARE THE SHAPERS OF PROGRESS



# NATIONAL TOOL Co.

11200 MADISON AVENUE

CLEVELAND, OHIO

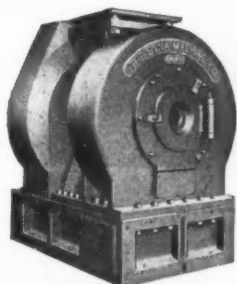
## ETNA SWAGING MACHINES

Are Built Standard with Capacities Up  
 to 6" Dia. Larger Sizes Up to 14" Dia.  
 Are Built On Order.

Hydraulic Operated  
 Tube Cutoff Mach.

Welded Tube Mills

ROTARY SWAGERS  
 HYDRAULIC FEEDS



The ETNA MACHINE Co.  
 3400 MAPLEWOOD AVE. TOLEDO, OHIO

## JIGS, FIXTURES AND DIES

Designed by  
**COLUMBUS** Espe-  
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**PERFORATED SHEETS OF EVERY DESCRIPTION**  
 Promptly made to your  
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## Whatever your requirement in a Flexible Shaft Machine

The Wyco line carries a complete range of rugged,  
 dependable units to fit any production need. The  
 Wyco line is on the aircraft and armament front  
 NOW, and doing a civilian production job as well  
 —but for the post war era—for even greater de-  
 mands—the Wyco line will be geared up for  
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 medium or light duty production is desired.

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 Shaft and Radial Type Machines, all carrying the  
 Wyco Guarantee for materials and workmanship,  
 are setting records for longer shaft life and  
 greater production. Distributed through Jobbers.

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CHICAGO 22, ILL.



# Classified and Re-Sale Section

## EMCO REBUILT MACHINE TOOLS

### ENGINE LATHES

12"x7' Reed, d.c. m.d.  
14"x6' American Geared Head, m.d.  
14"x6' American Geared Head, m.d., taper  
14"x6' Springfield Geared Head, m.d.  
14"x8' Sidney, Driveall m.d.  
16"x6' Lodge & Shipley, cone  
16"x6' Reed-Prentice Geared Head, m.d., (2)  
18"x6' Hendey Yoke Head, motorized, taper  
18"x6' Hendey Yoke Head, motorized, carriage spacing attach.  
18"x12' Boye & Emmes, Lima m.d.  
19"x10' Sidney, Lima m.d.  
20"x9' Lehmann Geared Head, m.d., taper  
20"x10' LeBlond, cone  
20"x11' Reed-Prentice Geared Head, m.d.  
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, with 100 H.P. D.C. motor, weight 65,000 lbs.  
23"x10' LeBlond Geared Head, m.d.  
22"x18' Niles, cone  
24"x10' Bridgeford Geared Head, m.d., taper  
24"x10' Greaves-Klusman, cone, motorized, taper  
24"x10' New Haven, cone  
24"x12' Schumacher-Boye, cone, motorized  
25"x18' LeBlond Geared Head, m.d.  
26"x12' Schumacher-Boye, cone, motorized  
24" raised to 30"x12' Fifeid, cone  
27"x16' LeBlond, cone, taper  
30"x14' American Geared Head, m.d.  
30"x14' Lodge & Shipley, m.d.  
30"x28' Greaves-Klusman, cone, motorized  
36"x10' Putnam, m.d.  
36"x12' Wright, cone

### HORIZONTAL MILLING MACHINES

No. 3B Milwaukee Plain, double overarm, m.d.  
No. 4 Cincinnati Plain, rect. overarm, m.d.  
No. 4 Cincinnati Plain, round overarm, m.d.  
No. 4B Milwaukee Plain, double overarm, m.d., vert. attach.

More than 1,000 machines in stock for prompt shipment.  
No priority required.

**THE EASTERN MACHINERY CO.**  
1006 TENNESSEE AVENUE, CINCINNATI, OHIO

No. 5B Heavy Brown & Sharpe Plain, m.d.  
No. 5 Cincinnati Plain, rect. overarm, extra heavy type  
No. 3 Cincinnati Universal, m.d.

### VERTICAL MILLING MACHINES

No. 2M Cincinnati, m.d. in base, p.f. rotary table, latest type  
No. 2 Brown & Sharpe, s.p.d.  
No. 2 Knight, m.d.  
No. 2 Kempsmith MaxiMiller, m.d. in base  
No. 3 Cincinnati, m.d.  
No. 3B Milwaukee, m.d. in base  
No. 4 Knight, m.d., p.d.f. to head  
No. 4 Cincinnati High Power, m.d., latest type  
No. 5 Jackson, m.d.  
No. 6 Becker, cone  
2 spindle Newton, m.d.

### MANUFACTURING MILLING MACHINES

No. 34-36 Cincinnati Plain Hydromatic, m.d., latest type  
No. 4-36 Cincinnati Plain Hydromatic, m.d., latest type  
No. 34-36 Cincinnati Duplex Hydromatic, m.d., latest type  
No. 34-36 Cincinnati Duplex Hydromatic, m.d., latest type, with tracer control  
4 1/2"x12" Pratt & Whitney Thread Miller, m.d.  
6x14" Pratt & Whitney Thread, belt  
6x48" Pratt & Whitney Thread, m.d.  
6x80" Pratt & Whitney Thread, m.d.  
28" Cincinnati Plain Automatic, s.p.d.  
36"x36"x14" Bement Slab, m.d.  
54"x54"x10" Liberty Planer Type, m.d., p.r.t.  
Carter & Hakes Mfg., Driveall m.d.  
No. 2, 12 Pratt & Whitney Lincoln Type, cone  
Becker Lincoln Type, cone  
Burr Mfg. Type, m.d.

## CIMSCO

## Rebuilt Machine Tools

### LATHES

20"x8' Sebastian Grd. Hd., M. D.  
16"x6' Lodge & Shipley Pat. Hd.

### PLANERS

28"x28"x8' Woodward & Powell  
24"x24"x6' Gray Planer  
42"x42"x20' Cincinnati Hypro Planer, 4 hds.

### GEAR CUTTERS AND HOBBER

6" Bilgram Bevel Gear Generator  
No. 6 Fellows Gear Shaper, 3 S.C.D.  
18" Gleason Bevel Gear Generator  
30" Gould & Eberhardt Gear Cutter  
No. 15H Gould & Eberhardt Hobber, M.D.  
No. 2 Pfauter Gear Hobber, M.D.  
No. 24H Gould & Eberhardt Gear Hobber, S.P.D.

### GRINDERS

Loes Bradner Gear Grinder  
Simplicity Piston Grinder

### MILLING MACHINES

No. 4 Cincinnati Vertical H.P. Miller, M.D.  
No. 4 Garvin Plain Millers-  
No. 2B Brown & Sharpe Plain Miller  
No. 2 Cincinnati Universal H.P. S.P.D.

### RADIAL DRILLS

3' Cincinnati Bickford, Plain

### MISCELLANEOUS

4 spindle Sipp No. 2 Drill  
Sipp Single spindle drill 12" O.H.  
14" Niles Slotter, Cone Drive

If machines you need are not listed above, send us your inquiry. We have a very large stock.

**Cincinnati Machinery & Supply Co.**  
217 E. Second St., Cincinnati, Ohio

### LANDIS NO. 3 1/4 INTERNAL HYDRAULIC RACE GRINDER LATEST TYPE

Other High Grade Machines Available  
SEND US YOUR INQUIRY

**MOREY MACHINERY CO., Inc.**  
410 BROOME ST., NEW YORK

## WANTED—Engineer

Mechanical, with practical shop experience as well as technical training and schooling to work into position of Chief Engineer to succeed man who expects to retire from active work within the next five years.

Man should have experience in manufacturing small precision parts involving gear cutting of all types—grinding—turret lathe and screw machine work—milling—broaching—boring, etc.

Work will be directly under supervision of owners of the company which is a progressive manufacturer established for over 25 years.

Box No. 102, MACHINERY,  
148 Lafayette St., New York 13, N. Y.

## MANUFACTURERS' AGENTS WANTED

Manufacturer of a well established line of milling cutters, reamers, end mills, counterbores, formed cutters, dovetail and flat formed tools and special tools to blueprints has a few territories open for representation by manufacturers' agents. Careful attention will be given to applications from men of experience, whose records will stand up under careful investigation. All inquiries will be held in strictest confidence. Address Box No. 106, MACHINERY, 148 Lafayette St., New York 13, N. Y.

## WANTED Product to Manufacture

Leading organization of several hundred skilled designers, engineers, toolmakers and complete modern plant seeks post-war product or machinery. Will develop, manufacture . . . if desired will include advertising and sales. Royalty basis or any other satisfactory arrangement.

Box 110, MACHINERY, 148 Lafayette St., New York 13, N. Y.

## WANTED

### Mechanical Draftsman

preferably graduate engineer with hydraulic or heavy machinery design experience, for a concern located in the Milwaukee area, in same business for over 55 years. Permanent position after the war. Box No. 109, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

## PRESSES WANTED

No. 86 Bliss straight side reducing 14 inch stroke.  
No. 4A Bliss Toggle Press.

Or similar, must be in perfect condition. Address Box No. 111, MACHINERY, 148 Lafayette St., New York 13, N. Y.

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Well managed, progressive Milwaukee manufacturing company, building an established line of heavy machinery, and employing forty to fifty men, is in need of a competent plant superintendent. Position is permanent and offers unusual opportunities for an experienced man with initiative and executive ability. Please submit full details, qualifications, experience, salary and when available, which will receive prompt and confidential attention. Box 112, MACHINERY, 148 Lafayette St., New York 13, N. Y.

# PRICED FOR QUICK SALE!

## GRINDERS

### UNIVERSAL:

No. 2 CINCINNATI.  
No. 1 LANDIS; Bath UNIVERSAL.

### INTERNAL:

No. 72 HEALD SIZEMATIC.  
No. 52 GREENFIELD HYDROILS (2).  
No. 60 HEALD.

### CENTERLESS:

Model M-1 ZEPHYR.

### SURFACE:

No. 16A BLANCHARD, M.D.  
No. 16 BLANCHARD, M.D.  
15"x15"x96" NORTON; 2 Mag. chucks;

### CYLINDRICAL:

10"x72" LANDIS Plain, M.D.  
No. 22 LANDIS; 10"x36" LANDIS.

### TOOL AND CUTTER:

No. 1 W&M.

32"x10'6" FARREL ROLL GRINDER.  
Grinds rolls up to 34" diameter. 10'  
between centers, M.D. AC motors.

## PLANERS

### 36" SELLERS PLATE PLANER.

Pneumatic Holddowns, Motor drive.

60"x60"x12' CLEVELAND OPENSIDE,  
2 hds. on rail, M.D.  
60"x60"x18' WOODWARD POWELL, 4 hds.  
60"x60"x18' POND, 2 heads, M.D.  
60"x48"x12' GRAY, 4 heads, M.D.  
44"x36"x12' GRAY, 2 heads on rail.

## HORIZONTAL BORING MILLS

5" NBP, Floor Type, M.D. with motor.  
5" OHIO, Spindle Table Type, M.D.  
5" DETRICK HARVEY, M.D., No. 6 M.T.  
3 1/2" No. 32 G&L, M.D., 3" LUCAS, M.D.  
3 1/2" No. 0 G&L; 4" KEMPSMITH.  
3 1/2" BARRETT, M.D., Floor Type.  
7" BARRETT, S.P.D., 5 1/2" NILES.  
2 1/2" NEWARK; 3 1/2" BEAMAN SMITH.  
3" PUTNAM, M.D.

## MILLING MACHINES

### PLAIN:

No. 2-B K&T Double Overarm;  
No. 5 CINCINNATI, Rect. Overarm.  
No. 4 CINCINNATI, Cone Drive.  
No. 4 LEBLOND HEAVY DUTY.  
No. 3 CINCINNATI, S.P.D.  
No. 3 VAN NORMAN DUPLEX.

### UNIVERSAL:

No. 1 1/2 HENDEY NORTON.

### VERTICAL:

Nos. 3 and 2 B & S.  
No. 3 CINCINNATI.  
No. 2 1/2 B KEARNEY TRECKER.

### THREAD MILLS:

6"x48", 6"x72" P&W.

No. 3 LEES BRADNER.

### PLANNER TYPE AND SLAB:

42"x13" INGERSOLL SLAB;  
42"x36"x6" BEAMAN & SMITH.

### PRODUCTION:

OHIO, Type P, M.D.  
Table 16"x72", New 1941;  
10"x24"x15" K&T Simplex, M.D.  
24" CINCINNATI Plain Automatic.  
18" CINCINNATI Automatics.  
No. 45 PRODUCTOMATIC.  
10" PRATT WHITNEY.

## SCREW MACHINES

1 1/2" FOOTE BURT; Single Spindle

Hyd. Feed, M.D.

2 1/2" GRIDLEYS—1 spindle (2).

No. 55 NATIONAL ACMES.

9/16" DAVENPORT, 5 sp. AUTO. M.D.

No. 652 NEW BRITAIN CHUCKER.

Nos. 2 and 3 MANVILLE WOOD SCREW

## FLOOR LATHES

NEW 14"x8" ROBBINS GEARED HEAD

TOOL ROOM LATHES.

—No Priority Required—

36"x17" AMERICAN GD. HD., M.D.

30"x12" LEBLOND. 24"x12" HAMILTON,

16"x5" ROCKFORD; 14"x5" CHAMPION.

16"x6" PRATT WHITNEY Gd. Hd.

30" PIT. Face plate 156".

14"x4" LODGE SHIPLEY.

## TURRET LATHES

No. 1-A WARNER SWASEY, M.D., Bar feed.

26" LIBBEY; 7 1/2" hole in spindle.

18" LIBBEY, 3 1/2" hole in spindle.

No. 4 WARNER SWASEY.

JONES LAMSON GD. HD., M.D., 2 1/4"x24"

and 3"x36", Bar Feeds and Chucks.

Nos. 2 and 3 FOSTER; Nos. 2 and 3 WOODS.

No. 2 BARDONS & OLIVER.

AMERICAN HAND TURRET LATHE;

1 1/2" Hole in Spindle.

21" GISHOLTS, 3 1/2" and 5" holes in spindle.

28" NILES BEMENT POND, Gd. Hd. 4 1/2" hole

## FLOOR DRILLS

No. 263 BARNES 26" S.H., Camel Back,

Self Oiling, M.D.

No. 242 BARNES 25", M.D. 24" BARNES.

25" SNYDER, 36" PRENTICE.

25" WEIGEL. 24" CINCINNATI, Tapping att.

14" and 16" H&W; 16" and 13" AVEY.

2 Spindle FOOTE BURT Heavy Duty.

8 Spindle MULTIPLE, M.D. No. 5 M.T.

## VERTICAL BORING MILLS

12' BETTS, 2 Swivel Heads, 4 Chuck Jaws.

8' KING, 2 rail heads, M.D.

72" COLBURN, M.D.

53" NBP; 51" BULLARD;

6" BULLARD MULT-AU-MATIC, M.D.

4 Stations. Late Type Machine.

8" BULLARD, 6 Spindle Mult-Au-Matic.

ROCKFORD 4-Sp. Vert. Drilling or Boring.

## SHAPER AND SLOTTERS

24" BETTS, RAPID TRAVERSE, Motor Drive

through gear box.

72" MORTON Drawcut SHAPER, 18 Ft. Trav.

14" GOULD & EBERHARDT, B.G.

No. 1042 BEMENT MILES Slotter.

BETTS SLOTTER, 9" stroke.

14" NEWTON, M.D.

## RADIAL DRILLS

6' AMERICAN UNIV., 15" col., Box Table, M.D.

6' AMERICAN, 14" Col., M.D.

3' AMERICAN, M.D.

4' REED PRENTICE and AMERICAN.

4' FOSDICK, Box Table, 12" Column, M.D.

4' and 3' FOSDICKS.

YARD8: 5800

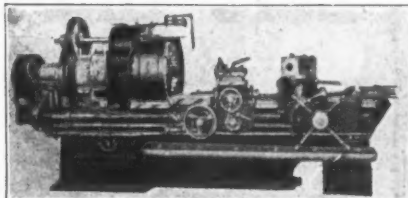
**INTERSTATE MACHINERY CO., Inc.** 1451 W. Pershing Rd., CHICAGO 9, ILL.

## QUALITY TOOLS

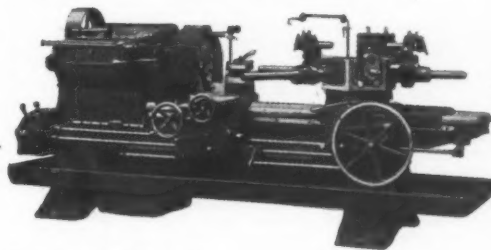
Automatics. 7" Baird 6 spindle chucking  
Automatics. 4 1/2" Gridley 4 spindle chucking  
Boring Mill. 3" Universal horizontal  
Boring Mill. 42" Bullard, 1 tur. & 1 pl. hd.  
Compressors. 1400' Sullivan and motor  
Compressor. 245' Ingersoll Rand ER1  
Drill, Radial. 3 1/2" American  
Drill, Radial. 4" Western, Timken brg.  
Drill, Multiple. Nos. 11, 12 and 13 Natco  
Gear Hobber. No. 16 H8 Gould Eberhardt  
Gear Shaper. No. Z1 Fellows  
Grinder. 12"x36", 16"x36" and 16"x52"  
Landis  
Grinder, Surface. 12"x24" Diamond  
Grinder, Internal. No. 72 Heald electric indi-  
cator, automatic  
Grinder, Crankpin. 16"x48" Landis  
Lathe, Stub. 8" Sundstrand  
Lathe, Turret. No. 3B Foster  
Lathe, Turret. 26" Libby, 4 1/2" or 7 1/2" hole  
Lathe, Turret. 36" Bullard vert., Rap. Prod.  
Miller. No. 2 Heavy Brown & Sharpe  
Miller. No. 2 Van Norman duplex  
Miller. No. 2 Brown & Sharpe vertical  
Miller. No. 3 Reed Prentice vertical  
Miller. 48" Ohio tilted offset  
Planer. 36"x36"x16" Cleveland openside  
Press. No. 174 Consolidated gap dbl. cr.  
Press. 51", No. 8Q84 Ferracute dbl. cr.  
Press. No. 33 Consolidated arch frame  
Press. No. 85 1/2 A Bliss reducing, New 1940  
Press. 600 Ton, No. 25A Bliss Coining,  
New 1941  
Thread Miller. Type C Hall Planetary

**MILES MACHINERY CO., Saginaw, Mich.**

## TURRET LATHES IN STOCK



3—21" Gisholt Universal  
Tilted Turret.  
1—21" Libby.  
1—18" Libby Model A.  
1—No. 2B Foster Universal  
Turret.  
1—No. 2 Acme Universal.  
1—2"x24" Jones & Lamson.  
1—2 Spindle (Flat Turret)  
Jones & Lamson.  
1—6A Potter & Johnston.  
2—24" Steinlee.



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## Established British Importers of Machine Tools

and allied specialties, with very complete  
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Large and heavy  
machine work.

**THE HILYARD COMPANY**  
NORRISTOWN, PA.

## Hand Screw Machine Products

UP TO 3" BAR OR CHUCK.

PRODUCTION MILLING ON DUPLICATE  
MACHINE PARTS.  
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MACHINES.

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To those manufacturers contemplating extending their export market to rapidly expanding British India excellent opportunities are offered through the medium of The Industrial & Commercial Trust Limited—an experienced well-established Company, financially sound with extensive ramifications throughout the country—to further that end.

This Company is prepared to consider the sole agency for India for machine tools, cutting tools, plywood and plastics of all kinds. Domestic radio, apparatus and accessories, automobiles and parts, and kindred lines.

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POSITIVE LOCKING TYPE METAL CUTTING  
TOOLS FOR MILLING, BORING AND TURNING

## JIG AND FIXTURE DESIGN

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## MACHINERY

148 Lafayette Street, New York 13, N. Y.

# Classified and Re-Sale Section

### GEAR MACHINERY

9" Pratt & Whitney Gear Grinder, M.D.  
11" Gleason Bevel Gear Generator  
No. 64 Fellows Gear Shaper, M.D.  
Olatool Gear Chamfering Machine, M.D.  
Lees-Bradner Gear Grinder

### SHAPERS—PLANERS

18"x18"x4' Whitcomb Planer  
36"x36"x8' Woodward & Powell Planer  
Rev. M.D.  
36"x48"x12' Cincinnati Hypo Planer 4 hds.  
24" Hendey M.D. Late Type

### MILLERS

4 1/4"x12" Pratt & Whitney Thread Millers  
Model L.T. 6"x36" Lees-Bradner Thread  
Miller, Latest Type  
No. 25-B DeLancey Hor. Bor. Mill 3 1/4" Bar,  
New 1941  
No. 1-12" and 1-18" Cincinnati Plain Auto-  
matic Millers, Latest Type  
No. 2 Cincinnati Vert. Miller, Dial Type  
No. 2-3-4 Plain and Vert. Cincinnati High  
Power Millers, M.D.  
New No. 3 Wigglesworth

### GRINDERS

16"x216" Landis Pl. Grinder—latest type  
No. 35 Galmeyer & Livingston Hydraulic Sur-  
face Grinders, Latest type  
10"x120" Norton Type C Grinders—latest type  
10"x120" Norton Pl. Grinder, M.D.  
12"x120" Landis Pl. M.D.  
No. 10 B. & S. Plain Grinder, M.D.

### LATHES—TURRET LATHES

6"x6 3/4" Goss & DeLeeuw Chucking Machine  
1 1/2" 4-Spd. Model G Gridley, M.D.  
2 1/2" Cleveland Model A  
No. 3A Warner & Swasey 4 1/2" Bar Stock,  
late type

### MISCELLANEOUS

No. 21-8A Cochrane-Bly H.S. Saw  
No. 171 Bliss Stiles Sprue Cutter  
New Delta Drilling Equipment

**WIGGLESWORTH MACHINERY CO.**

198 Bent St., Cambridge 41, Mass.

## DRAFTSMAN ENGINEER WANTED

### EXPERIENCED

MECHANICAL-AUTOMOTIVE  
AND ELECTRICAL APPLIANCES

STEADY POSITION POST-WAR  
GOOD OPPORTUNITY ADVANCEMENT

METROPOLITAN NEW YORK AREA

Send full resume, photograph (not returnable)  
and salary desired. Write Box 405, Equity,  
113 West 42nd St., N.Y.C.

## SALES ENGINEER AVAILABLE

Several years mechanical and sales training, excellent contacts New York State and Pennsylvania, thoroughly familiar with machine tools, their application and tooling. Experienced in soliciting contract work, complete tooling programs and special purpose automatic machinery. Qualified to discuss manufacturing and development problems and to make necessary recommendations. Also capable of assisting men in the field to close business. Will be available about Sept. 15. If interested in a man with the above experience and background communicate with Box 108, MACHINERY, 148 Lafayette St., New York 13, N. Y.

# Let's All Use Less Paper because—

Paper vests have proved excellent for aviators and ground crews as cold protection.

Paper is used for disposable gun covers and ordnance wraps to protect such equipment while making invasion landings.

The Army supplies helmets of

laminated fiber for non-combat duty in the tropics.

Many essential airplane parts are fabricated of plastic with a paper base.

Army trucks require 20 pounds of paper for safe delivery.

It takes 25 tons of blueprint paper to make a battleship.

Our boys need every bit of paper and paper board the Army can get to ship their precious invasion supplies in. And it's up to you and every other manufacturer to cut and cut and cut again on the use of paper and paper board.

For every time a convoy sets sail—that's so much more paper and paper board in action. And the supply, as you know, is diminishing.

So your job is to figure every known way, yes, and a few unknown ways, to USE LESS PAPER AND PAPER BOARD.

## EXECUTIVE AVAILABLE

With extensive experience as Assistant General Manager, Assistant to President, Works Manager and Industrial Engineer in both heavy and light machining and fabricating plants. Skilled in economical and expeditious plant operation from power house to shipping platform. Have maintained good labor and public relations. Excellent reason for being available. Last earnings exceeded \$12,000 but will consider \$8,000 to \$10,000 annually with a progressive company. Have War Manpower Commission Interarea Clearance Certificate. Age 50. Write Box 107, MACHINERY, 148 Lafayette St., New York 13, N. Y.

## REPRESENTATIVE

AVAILABLE—12 years experience in Govt. Sales, Exporting, Lend Lease; ample facilities for handling additional lines.

**D. C. ENGINEERING CO.**  
BARR BLDG. WASH. 6, D.C.

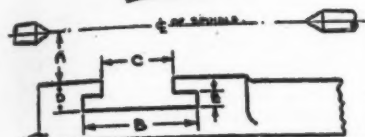


# Turret Lathe Operations

on Engine and Bench Lathes with ENCO TURRET TOOL POSTS



Model 4-S



Model of Lathe and Size	A	B	C	D	Maximum tool size desired

One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions, tool size desired and name and address of regular dealer.

- 12 position indexing
- 3 positions for each tool
- Carburized hardened steel construction
- Mounts rigidly in compound T-slot
- Keeps setting accurately
- Indexing is self-contained. Eliminates all chip interference

• Turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post to speed production on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at once saving valuable lost-time on 2nd operation set-ups. Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.

"A" Dimension range (from diagram on this page)	Model 6-S	Model 4-S	Model 3½-S	Model 2½-S	Model H
Lathe Swing	2"—3-1/8"	1-9/16"—2-1/2"	1-1/8"—1-3/4"	7/8"—1-5/16"	7/8"—1-5/16"
Maximum tool bit size	16" swing & up 1" or 1-1/4" 1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, tur- ret will be furnished for 1 inch tool bit)	13" to 16" swing 3/4" or 5/8" (Where no tool bit size is specified, tur- ret will be furnished for 5/8 inch tool bit)	16" to 13" swing 1/2" Sq.	Bench Lathe 3/8" Sq.	Bench Lathe 3/8" Sq.
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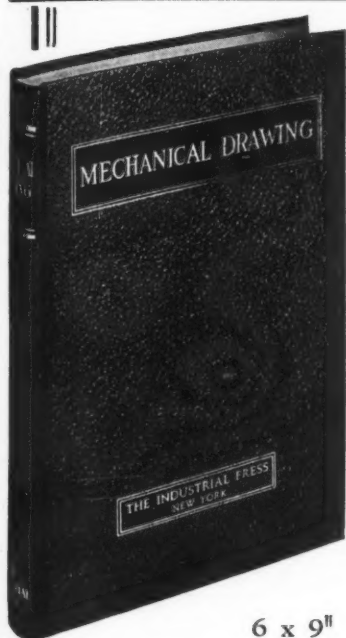
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## ABRASIVE DISCS—

See Discs, Abrasive

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**AIR TOOLS**—See Grinders,  
Pneumatic; Drills, Portable  
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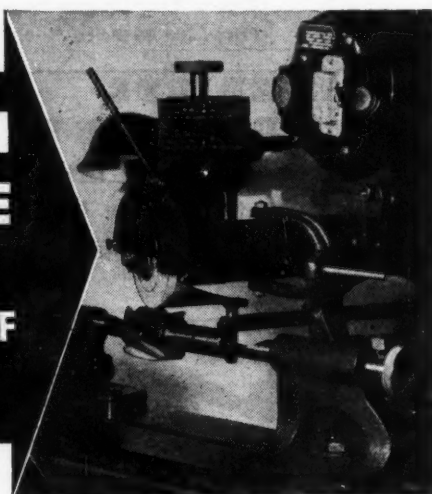
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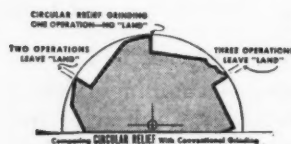
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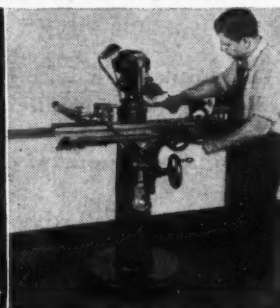
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types	appearance	what it cuts	how it cuts	features
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425—Known as Campbell Calculator		All sizes material up to 1 1/2" diameter solid stock and 1 1/2" diameter tubing.	Automatic wheel rotation moves the work as it is automatically fed through work.	Complete cutting cycle is hydraulically controlled by a single handle.
435—Campbell "Tube Cutter"		Designed for cutting rings from tubular stock or forgings with cut-off, flange and tapping.	Absorbs wheel rotation as it cuts through work tubing which is in feed. Complete hydraulic cycle is controlled by single handle including direction of cut.	Complete cutting cycle is hydraulically controlled by a single handle.
401—Automatic Abrasive Cutting Machines		Yam stock, annealed and normalized up to 4" O.D.	The cutting head controls are of cast iron and are mounted on a base giving a wide range of adjustment.	Complete number control, indexing, automatic reverse, etc. features.
303—"Automatic" Abrasive Cutting Machines		Cuts through flat or stock in one trip, annealed or normalized, also tubing up to 1 1/2" diameter.	Absorbs wheel rotation as it cuts through work tubing which is in feed. Complete hydraulic cycle is controlled by single handle including direction of cut.	Complete number control, indexing, automatic reverse, etc. features.
313—Campbell Abrasive Cutting Machines. Also equipped with hydraulic motor in U.S.A.		Cuts up to and including 1 1/2" or more in diameter tubing.	Work is automatically hydraulically clamped during cutting operation.	Campbell number control, indexing, automatic reverse, etc. features.

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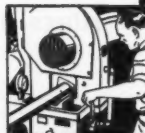
Based on the actual production records of the CAMPBELL complete range—the only complete range—of Abrasive Cutting Machines, Campbell engineers will gladly work up cost sheets and production procedures for your cutting. • All you need do is state the materials, shapes and sizes you are cutting, lengths before cutting, lengths of cut-off pieces and production required per hour. • The schedules given you will be practical and attainable. They will be based on the performance of some one of the 8 types and 19 models of CAMPBELL Abrasive Cutting Machines that are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics—solid bars, tubular and flat stock. • Ask for a copy of the chart shown above, too. It will give you fundamental information on the possibilities of abrasive cutting—at a glance.

**Campbell**  
**ABRASIVE CUTTING MACHINES**

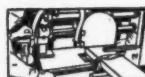
**ANDREW C. CAMPBELL DIVISION**  
BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

**AMERICAN CHAIN & CABLE COMPANY, Inc.**  
BRIDGEPORT • CONNECTICUT



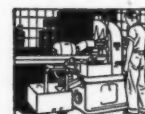
**Campbell Cutomatic No. 401**  
Oscillating and Rotating Wheel. Cuts steel up to 6".



**Campbell No. 302**  
Odd shapes, Flat Stock, Slotting Flat Stock, etc.



**Campbell No. 213**  
Cuts Tubing up to and including 3 1/2". Solids to 2".



**Campbell Calculator No. 425**  
Cuts Tubing up to and including 4 1/2". Solid Bar to 3 1/2".

**Lathe, Etc.**  
Anker-Holth Mfg. Co.  
Bullard Company  
Cushman Chuck Co.  
General Die-Stamping-Tool Co.  
Gisholt Mch. Co.  
Jones & Lamson Mch. Co.  
Rivett Lathe & Grinder, Inc.  
Scherr, George, Co., Inc.  
Warner & Swasey Co.

**Magnetic**  
Arter Grinding Machine Co.  
Brown & Sharpe Mfg. Co.  
Taft-Peirce Mfg. Co.  
Walker, O. S., Co., Inc.

**Multiple Work-Holding Type**  
Aero Corporation  
**Quick Change and Safety**  
Errington Mechanical Laboratory  
Jarvis, Chas. L., Co.  
Lee, K. O., & Son Co.  
McCroskey Tool Corp.  
Modern Tool Works  
National Tool Co.  
Proconier Safety Chuck Co.  
Scully-Jones & Co.

**Ring Wheel**  
Bridgeport Safety Emery Wheel Co., Inc.  
Gardner Machine Co.

**Tapping**  
Barber-Colman Co.  
Errington Mechanical Laboratory  
Greenfield Tap & Die Corp.  
McCroskey Tool Corp.  
Proconier Safety Chuck Co.  
Scully-Jones & Co.

**CIRCUIT BREAKERS**  
General Electric Co.  
Spencer Thermostat Co.  
Westinghouse Elec. & Mfg. Co.

**CLAMPS**  
Armstrong Brothers Tool Co.  
Baumbach, E. A., Mfg. Co.  
Bealy, Chas. H., & Co.  
Brown & Sharpe Mfg. Co.  
Dandy Machine Specialties, Inc.  
Grand Specialties Co.  
Knu-Vise, Inc.  
Starrett, L. S., Co.  
Williams, J. H., & Co.

**CLEANERS, Chemical, for Metal**  
Bullard Co., Bullard-Dunn Process Div.  
Oakite Products, Inc.

**CLEANERS, Floor, Oil Absorbent**  
Refiners Lubricating Co.  
Waverly Petroleum Products Co.

**CLUTCHES**  
Barnes Drill Co.  
Clearing Mch. Corp.  
Dodge Mfg. Corp.  
Farrel-Birmingham Co., Inc.  
Foot Bros. Gear & Machine Corp.  
Hill Acme Co.  
Hilliard Corp.  
Lipe-Rollway Corp.  
Morse Chain Co.  
Rockford Drilling Mch. Div.  
Twin Disc Clutch Co.

**COATINGS, PROTECTIVE**  
Bullard Co., Bullard-Dunn Process Div.

**COLLARS, Safety**  
Hill Acme Co.  
Standard Pressed Steel Co.

**Spacing, Etc.**  
Scully-Jones & Co.

**COLLETS**  
Ames, B. C., Co.  
Anker-Holth Mfg. Co.  
Brown & Sharpe Mfg. Co.  
Cleveland Twist Drill Co.  
General Die-Stamping-Tool Co.  
Gisholt Mch. Co.  
Hannifin Mfg. Co.  
Hardinge Brothers, Inc.  
Jones & Lamson Mch. Co.  
Modern Tool Wks.  
New Britain-Gridley Mch. Div., New Britain Machine Co.  
Pratt & Whitney Co.  
Rivett Lathe & Grinder, Inc.  
Scully-Jones & Co.  
Standard Tool Co.  
Union Twist Drill Co.  
Warner & Swasey Co.

**COMPARATORS**  
(See Gages, Comparator).

**COMPARATORS, Screw Thread**  
Jones & Lamson Mch. Co.  
Scherr, George, Co., Inc.

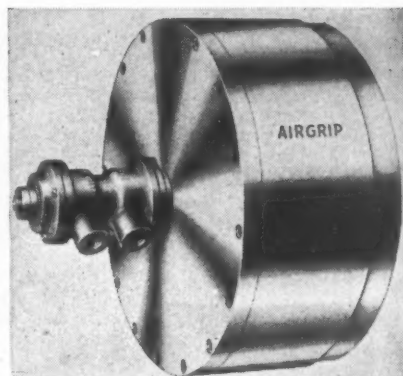
**COMPOUND, Cleaning**  
Houghton, E. F., & Co.  
Oakite Products, Inc.  
**Cutting, Grinding, Metal Drawing, etc.**  
Cities Service Oil Co.  
Gulf Oil Corp.  
National Broach & Mch. Co.  
(Broaching and Lapping)  
Oakite Products, Inc.  
Peerless Machine Co.  
Richard, G. Whitfield.  
Shell Oil Co., Inc.  
Standard Oil Co. (Indiana).  
Stuart, D. A., Oil Co., Ltd.  
Sun Oil Co.  
Texas Co.  
Tide Water Associated Oil Co.

**Give WINGS TO PRODUCTION!**

**"Airgrip"**

**Revolving Air Cylinders**

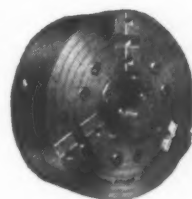
"AIRGRIP" Revolving Air Cylinders, on double ball bearings permit speeds formerly impossible. Minimum maintenance. Today's top speed and peak efficiency requirements in air chucks demand superior air cylinder performance and service. Under average conditions, the cylinder will run for years without attention. No manual adjustment of packings. Wear automatically taken up by air pressure within the cylinder.



**"Airgrip"**

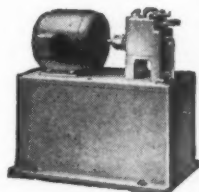
**Chucks**

Boost output records, slash costs. "Airgrip" Chucks double gripping power, externally or internally. Work held tight, even if air supply is cut off completely. "Airgrip" 2- and 3-jaw Universal Chucks permit heavier cuts and coarser feeds.



**Hi-po supercharged**

**Hydraulic Pressure Pump**



3000 lb.-Pressure Pump, driven by a 1/2 h. p. motor! Double-Pressure Production; consists of a low-pressure section which supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

**Anker-Holth Mfg. Co.**

2727 Connors St., Port Huron, Michigan

**Resin or Molding**  
General Electric Co.  
**COMPRESSORS, Air**  
Ingersoll-Rand Co.  
**CONTRACT WORK**  
Ace Manufacturing Corp.  
Columbus Die, Tool & Mch. Co.  
Diefendorf Gear Corp.  
Ex-Cell-O Corp.  
Hartford Special Mchry. Co.  
Hill Acme Co.  
Jefferson Machine Tool Co.  
Kaydon Engrg. Corp.  
LeBlond, R. K., Mch. Tool Co.  
Lees-Bradner Co.  
Modern Mch. Corp.  
Mummert-Dixon Co.  
National Acme Co.  
Peerless Machine Co.  
Pollak Mfg. Co.  
Rockford Machine Tool Co.  
Taft-Peirce Mfg. Co.  
U. S. Tool Co., Inc.  
Wisco Machine Corp.  
**CONTROLLERS**  
Allen-Bradley Co.

Clark Controller Co.  
General Electric Co.  
Westinghouse Air Brake Co.  
**CONVEYOR SYSTEMS**  
Link-Belt Co.  
**COOLANT SYSTEMS**  
Gray Mills Co.  
Peerless Machine Co.  
**COUNTERBORES**  
Carboloy Co., Inc.  
Cleveland Twist Drill Co.  
Ex-Cell-O Corporation  
Firth-Sterling Steel Co.  
Gairing Tool Co.  
Haynes Stellite Co.  
Kennametal, Inc.  
Lake Shore Tool Works, Div.  
Morse Twist Drill & Mch. Co.  
National Tool Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Starrett, L. S., Co.  
Super Tool Co.  
Union Twist Drill Co.  
Wesson Co.

**COUNTERSHAFTS**  
Hill Acme Co.  
LeBlond, R. K., Mch. Tool Co.  
Standard Pressed Steel Co.  
Warner & Swasey Co.  
**COUNTERSINKS**  
Cogsdill Twist Drill Co., Inc.  
Ex-Cell-O Corp.  
Gairing Tool Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Super Tool Co.  
Union Twist Drill Co.  
**COUNTERS, Revolution**  
Brown & Sharpe Mfg. Co.  
Starrett, L. S., Co.  
Veeder-Root, Inc.  
**COUNTING DEVICES**  
Starrett, L. S., Co.  
Veeder-Root, Inc.  
**COUPLINGS, Flexible**  
Atlantic Gear Works, Inc.  
Baldor Electric Co.

Boston Gear Works, Inc.  
Farrel-Birmingham Co., Inc.  
Foots Bros. Gear & Machine Corp.  
Hill Acme Co.  
James, D. O., Mfg. Co.  
Lovejoy Flexible Coupling Co.  
Morse Chain Co.  
Philadelphia Gear Works  
Whitney Chain & Mfg. Co.  
**Shaft**  
Boston Gear Works, Inc.  
Foots Bros. Gear & Machine Corp.  
Hill Acme Co.  
Hilliard Corp.  
Sellers, Wm. & Co., Inc.  
Standard Pressed Steel Co.  
**CRANES, Electric Traveling**  
Morgan Engineering Co.  
Shepard Niles Crane & Hoist Corp.  
**Hand Traveling**  
Shepard Niles Crane & Hoist Corp.  
**Locomotive**  
Cullen-Friedstedt Co.  
Hill Acme Co.

**CUTTER GRINDERS**  
See Grinding Machines, Universal, for  
Sharpening Cutters, Reamers,  
Hobs, Etc.

**CUTTERS, Gear**  
Brown & Sharpe Mfg. Co.  
Ex-Cell-O Corp.  
Fellows Gear Shaper Co.  
Illinois Tool Wks.  
Lake Shore Tool Works Div.  
Michigan Tool Co.  
Morse Twist Drill & Mch. Co.  
National Broach & Mch. Co.  
(Gear Shaper)  
National Tool Co.  
National Twist Drill & Tool Co.  
O.K. Tool Co., Inc.  
Pratt & Whitney Co.  
Standard Tool Co.  
Union Twist Drill Co.  
U. S. Machine Tool Mfg. Corp.  
Waltham Mch. Wks.

**Milling**  
Aeronautical Mfg. Co.  
Barber-Colman Co.  
Brown & Sharpe Mfg. Co.  
Carboloy Co., Inc.  
Columbus Die, Tool & Machine Co.  
Ex-Cell-O Corp.  
Firth-Sterling Steel Co.  
Ford, M. A., Mfg. Co.  
Gairing Tool Co.  
Gammons-Hoagland Co.  
Gorton, George, Mch. Co.  
Haynes Stellite Co.  
Illinois Tool Wks.  
Ingersoll Milling Mch. Co.  
Kearney & Trecker Corp.  
Kennametal, Inc.  
Lake Shore Tool Works Div.  
McCroskey Tool Corp.  
Michigan Tool Co.  
Modern Tool Wks.  
Morse Twist Drill & Mch. Co.  
National Tool Co.  
National Twist Drill & Tool Co.  
O.K. Tool Co., Inc.  
Onarud Machine Works, Inc.  
Pipe Machinery Co.  
Pratt & Whitney Co.  
Producto Machine Co.  
Reed-Prentice Corp.  
Scully-Jones Co.  
Slocumb, J. T., Co.  
Sommer & Adams Co.  
Sosner Tap & Tool Corp.  
Standard Tool Co.  
Super Tool Co.  
Union Twist Drill Co.  
U. S. Machine Tool Mfg. Corp.  
Whitney Chain & Mfg. Co.  
(For Woodruff Keys.)

**CUTTING COMPOUNDS**  
See Compounds, Cutting, Grinding.  
Etc.

**CUTTING-OFF MACHINES**  
Avey Drilling Machine Co.  
Bardons & Oliver, Inc.  
Bridgeport Safety Emery Wheel  
Co., Inc.  
Brown & Sharpe Mfg. Co.  
Consolidated Mch. Tool Corp.  
Landis Mch. Co., Inc.

**Abrasive Wheel**  
Armstrong Brothers Tool Co.  
Bridgeport Safety Emery Wheel  
Co., Inc.  
Campbell, Andrew C., Div. American  
Chain & Cable Co., Inc.  
Delta Mfg. Co.  
deSanno, A. P., & Son, Inc.  
Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.  
Peerless Machine Co.

**Cold Saw**  
See Sawing Machines, Circular.

**CUTTING-OFF TOOLS**  
Armstrong Brothers Tool Co.  
Empire Tool Co.  
Firth-Sterling Steel Co.  
Haynes Stellite Co.  
Illinois Tool Wks.  
Luera, J. Milton  
Peerless Machine Co.  
Pratt & Whitney Co.  
Ready Tool Co.  
U. S. Machine Tool Mfg. Corp.  
Williams, J. H., & Co.

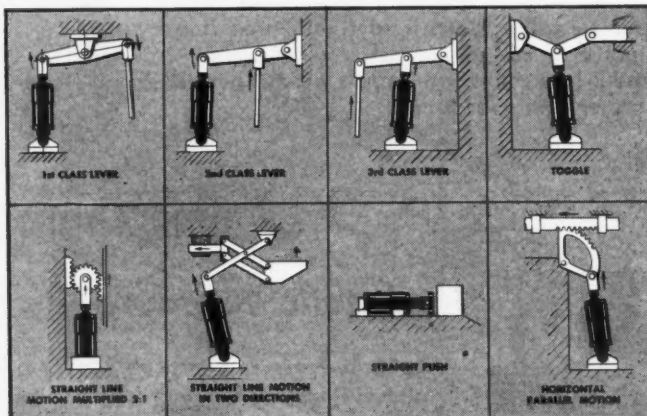
**CUTTING-OFF WHEELS, Abrasive**  
Bay State Abrasive Co.

## When You Want to PUSH-PULL-LIFT PRESS-CLAMP-CONTROL



## Hanna *Air and Hydraulic* Cylinders

Go over the operations in your plant and check the machines and equipment you build. It is likely you will find places where Hanna Cylinder Power can save you time, labor, costs and improve operations. Then ask a Hanna Engineer to help you apply the advantages of Hanna Cylinders.



Write for Hanna Cylinder Catalogs No. 230 (low pressure) and No. 233 (high pressure). They will give you complete specifications and much informative data. Free to executives and engineers.



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1765 ELSTON AVENUE • CHICAGO 22, ILLINOIS  
AIR & HYDRAULIC RIVETERS • CYLINDERS • AIR HOISTS



Carborundum Co.  
Folger Mfg. Co.  
Norton Co.

#### CYLINDER BORING MACHINES

Baker Brothers  
Barnes Drill Co.  
Consolidated Mch. Tool Corp.  
Ex-Cell-O Corp.  
Ingersoll Milling Mch. Co.  
Moline Tool Co.  
Sellers, Wm. & Co., Inc.

#### CYLINDERS, Hydraulic

American Hollow Boring Co.  
Anker-Holth Mfg. Co.  
Barnes, John S., Corp.  
Clearing Mch. Corp.  
Denison Engineering Co.  
Galland-Henning Mfg. Co.  
Hanna Engrg. Works  
Hannifin Mfg. Co.  
Hydraulic Products Co.  
Logansport Machine, Inc.  
Rockford Machine Tool Co.

#### Pneumatic

Anker-Holth Mfg. Co.  
Clearing Mch. Corp.  
Hanna Engrg. Works  
Hannifin Mfg. Co.  
Hydraulic Products Co.

#### DEALERS, Machinery

Bealy, Chas. H., & Co.  
Earle Gear & Mch. Co.  
Interstate Machinery Co.  
Jefferson Machine Tool Co.  
Ryerson, Joseph T., & Son, Inc.  
Simmons Machine Tool Corp.

#### DEMAGNETIZERS

Blanchard Mch. Co.  
Heald Machine Co.  
Walker, O. S., Co., Inc.

#### DESIGNERS, Machine and Tool

Designers for Industry, Inc.  
Ex-Cell-O Corp.  
Hartford Special Mchry. Co.  
Pollak Mfg. Co.  
Ruthman Mchry. Co.

#### DIAMONDS and Diamond Tools

Desmond-Stephan Mfg. Co.  
Diamond Tool Co.  
Smit, J. K., & Co.  
Super Tool Co.  
Westcoast Diamond Tool Co.

#### DIE CASTING MACHINES

Kux Machine Co.  
Madison-Kipp Corp.  
Reed-Prentice Corp.

#### DIE CASTINGS

See Castings, Die

#### DIE CUSHIONS, Pneumatic

Clearing Mch. Corp.  
Verson Allsteel Press Co.

#### DIE INSERTS, Carbide

Carboloy Co., Inc.  
Firth-Sterling Steel Co.  
Kennametal, Inc.

#### DIE MAKERS' SUPPLIES

Baumbach, E. A., Mfg. Co.  
Chicago Wheel & Mfg. Co.  
Danly Mch. Specialties, Inc.  
U. S. Machine Tool Mfg. Corp.  
U. S. Tool Company, Inc.

#### DIE MAKING MACHINES

Grob Brothers  
Kearney & Trecker Corp.  
Oliver Instrument Co.  
Peerless Machine Co.

#### DIE SETS, Standard

Baumbach, E. A., Mfg. Co.  
Danly Mch. Specialties, Inc.  
Pratt & Whitney Co.  
Producto Machine Co.

#### DIE SINKING MACHINES

Cincinnati Milling Mch. Co.  
Gorton, George, Mch. Co.  
Pratt & Whitney Co.  
Reed-Prentice Corp.

#### DIE SINKING PRESSES

Baldwin-Southwark Corp.  
Kearney & Trecker Corp.

#### DIE STOCKS

See Stocks, Die

#### DIES, Lettering and Embossing

Noble & Westbrook Mfg. Co.

#### DIES, Sheet Metal, Etc.

Baumbach, E. A., Mfg. Co.  
Columbus Die, Tool & Mch. Co.  
Modern Machine Corp.  
Niagara Mch. & Tool Wks.  
Peck, Stow & Wilcox Co.  
Ruthman Mchry. Co.  
Taft-Peirce Co.  
V & O Press Co.  
Verson Allsteel Press Co.  
Waltham Mch. Wks.

#### Threading

Butterfield Div. Union Twist Drill Co.  
Card, S. W., Mfg. Co.  
Eastern Mch. Screw Corp.  
Geometric Tool Co.  
Greenfield Tap & Die Corp.  
Hill Acme Co.  
Jones & Lamson Mch. Co.  
Landie Mch. Co., Inc.

Modern Tool Works  
Morse Twist Drill & Mch. Co.  
Murchey Mch. & Tool Co.  
National Acme Co.  
Oster Manufacturing Co.  
Peerless Machine Co.  
Pratt & Whitney Co.  
Standard Tool Co.

#### Threading Opening

Eastern Mch. Screw Corp.  
Errington Mechanical Laboratory  
Geometric Tool Co.  
Hill Acme Co.  
Jones & Lamson Mch. Co.  
Landie Mch. Co.  
Modern Tool Wks.  
Murchey Mch. & Tool Co.  
National Acme Co.  
Oster Manufacturing Co.  
Peerless Machine Co.  
Rickert-Shafer Co.

#### Thread Rolling

Hanson-Whitney Mch. Co.  
Pratt & Whitney Co.  
Rolled Thread Die Co.

#### DISCS, Abrasive

Abrasive Co.

Abrasive Products, Inc.  
Bealy, Chas. H., & Co.  
Carborundum Co.  
de Sanno, A. P., & Son, Inc.  
Folger Mfg. Co.  
Gardner Mch. Co.  
Hanchett Mfg. Co.  
Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.  
Peerless Machine Co.  
Norton Co.  
Walls Sales Corp.

#### DIVIDING HEADS

See Index Centers.

#### DOWEL PINS

Allen Mfg. Co.  
Baumbach, E. A., Mfg. Co.  
Danly Mch. Specialties, Inc.  
U. S. Tool Co., Inc.

#### DRESSERS, Grinding Wheel

American Gauge Co.  
Best Tools Corp.  
Carboloy Co., Inc.  
Desmond-Stephan Mfg. Co.  
Diamond Tool Co.  
Lee, K. O., & Son Co.

Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.  
Norton Co.  
Smit, J. K., & Co.  
Standard Tool Co.  
Super Tool Co.  
Vince Corporation

#### DRIFTS, DRILL

Armstrong Bros. Tool Co.  
Standard Tool Co.

#### DRILL HEADS, Unit Type

Barnes Drill Co.  
Rehnberg-Jacobson Mfg. Co.

#### Multiple

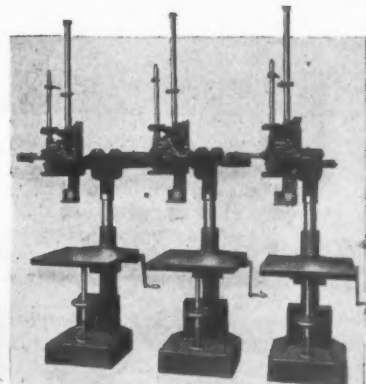
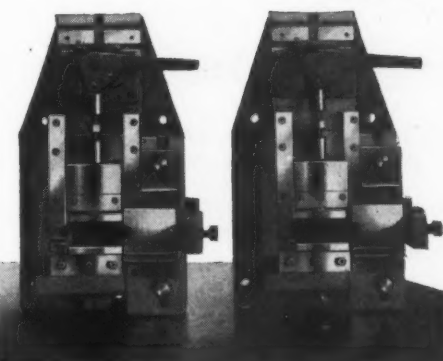
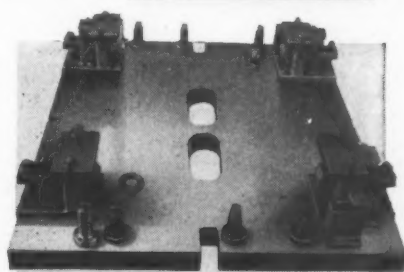
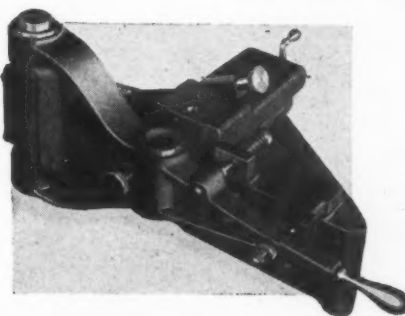
Baker Brothers, Inc.  
Barnes Drill Co.  
Buffalo Forge Co.  
Buhr Machine Tool Co.  
Delta Mfg. Co.  
Errington Mechanical Laboratory  
Ettco Tool Co.  
Ex-Cell-O Corp.  
Hoefler Mfg. Co.  
Moline Tool Co.

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*Special Delivery*  
FROM SOMMER & ADAMS



The fixtures shown on this page are typical of many which have sprung from Sommer & Adams' more than 25 years' acquaintance with actual requirements in the field. Fixtures for checking, milling, drilling, tapping, grinding and other purposes are at your call. They are marked by interchangeability of parts, accuracy and high production possibilities.



We'll be glad to help you plan your tooling program.



THE **SOMMER & ADAMS** COMPANY  
1851 EUCLID AVENUE CLEVELAND 12, OHIO  
*Custom-Built* EQUIPMENT FOR MANY PURPOSES

#### DRILL SOCKETS

Armstrong Bros. Tool Co.  
Cleveland Twist Drill Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Union Twist Drill Co.

#### DRILL SPEEDERS

Graham Mfg. Co., Inc.  
Hofer Mfg. Co.

#### DRILL STANDS

Cleveland Twist Drill Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Standard Tool Co.  
Union Twist Drill Co.

#### DRILLING MACHINES, Automatic

Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes Drill Co.  
Barnes, W. F. & John, Co.  
Bodine Corp.  
Bradford Machine Tool Co.  
Buhr Machine Tool Co.

Consolidated Mch. Tool Corp.  
Grant Mfg. & Mch. Co.  
Hofer Mfg. Co.  
Kingsbury Mch. Tool Corp.

#### Bench

Ames, B. C., Co.  
Atlas Press Co.  
Avey Drilling Machine Co.  
Buffalo Forge Co.  
Delta Mfg. Co.  
Dumore Co.  
Elgin Tool Wks., Inc.  
Fosdick Machine Tool Co.  
Henry & Wright Mfg. Co.  
Leland-Gifford Co.  
Moline Tool Co.  
Production Machine Co.  
Walker-Turner Co., Inc.

#### Boiler

Cincinnati Bickford Tool Co.  
Foote-Burt Co.  
Sellers, Wm., & Co., Inc.

#### Gang

Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes Drill Co.  
Cincinnati Bickford Tool Co.  
Consolidated Mch. Tool Corp.  
Delta Mfg. Co.

Foote-Burt Co.  
Fosdick Machine Tool Co.  
Ingersoll Milling Mch. Co.  
Leland-Gifford Co.  
Moline Tool Co.  
Production Machine Co.  
Producto Machine Co.  
Sellers, Wm., & Co., Inc.

#### Horizontal Duplex

Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes, W. F. & John, Co.  
Bradford Machine Tool Co.  
Consolidated Mch. Tool Corp.  
Davis & Thompson Co.  
Frew Machine Co.  
Kingsbury Mch. Tool Corp.  
Murchey Mch. & Tool Co.  
Sundstrand Mch. Tool Co.

#### Inverted

Baker Brothers, Inc.  
Barnes Drill Co.

#### Multiple Center Column Type

Barnes Drill Co.

#### Multiple Spindle

Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes Drill Co.

Barnes, W. F. & John, Co.  
Baush Machine Tool Co.  
Bradford Machine Tool Co.  
Buffalo Forge Co.  
Buhr Machine Tool Co.  
Cincinnati Bickford Tool Co.  
Delta Mfg. Co.  
Foote-Burt Co.  
Fosdick Machine Tool Co.  
Greenlee Bros. & Co.  
Henry & Wright Mfg. Co.  
Ingersoll Milling Mch. Co.  
Kingsbury Mch. Tool Corp.  
Leland-Gifford Co.  
Moline Tool Co.  
Pratt & Whitney Co.  
Production Mch. Co.  
Sellers, Wm., & Co., Inc.

#### Radial

American Tool Wks. Co.  
Carlton Machine Tool Co.  
Cincinnati Bickford Tool Co.  
Foote-Burt Co.  
Fosdick Machine Tool Co.  
Giddings & Lewis Mch. Tool Co.  
Onarud Machine Works, Inc.  
Sellers, Wm., & Co., Inc.

#### Rail

See Drilling Machines, Gang.

#### Sensitive

Atlas Press Co.  
Avey Drilling Machine Co.  
Buffalo Forge Co.  
Delta Mfg. Co.  
Foote-Burt Co.  
Fosdick Machine Tool Co.  
Henry & Wright Mfg. Co.  
Leland-Gifford Co.  
Moline Tool Co.  
Pratt & Whitney Co.  
Production Mch. Co.  
Producto Machine Co.  
Rivett Lathe & Grinder, Inc.  
Ryerson, Joseph T., & Son, Inc.

#### Upright

Atlas Press Co.  
Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes Drill Co.  
Barnes, W. F. & John, Co.  
Buffalo Forge Co.  
Cincinnati Bickford Tool Co.  
Consolidated Mch. Tool Corp.  
Delta Mfg. Co.  
Duro Metal Products Co.  
Foote-Burt Co.  
Fosdick Machine Tool Co.  
Hofer Mfg. Co.  
Ingersoll Milling Mch. Co.  
Leland-Gifford Co.  
Moline Tool Co.  
Production Mch. Co.  
Producto Machine Co.  
Rehnberg-Jacobson Mfg. Co.  
Rogers Machine Works, Inc.  
Ryerson, Joseph T., & Son, Inc.  
Sellers, Wm., & Co., Inc.

#### Wall Radial

Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.

#### DRILLS, Center

Cleveland Twist Drill Co.  
Cogsdill Twist Drill Co., Inc.  
Gairing Tool Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Standard Tool Co.  
Union Twist Drill Co.  
Warner & Swasey Co.

#### Core

Carboloy Co., Inc.  
Ex-Cell-O Corp.  
Firth-Sterling Steel Co.  
Gairing Tool Co.  
Haynes Stellite Co.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Super Tool Co.  
Union Twist Drill Co.

#### Portable Electric

Dumore Co.  
Ryerson, Joseph T., & Son, Inc.

#### Portable Pneumatic

Ingersoll-Rand Co.  
Onarud Machine Works, Inc.  
Rotor Tool Co.  
Skillsaw, Inc.

#### Ratchet

Armstrong Bros. Tool Co.  
Cleveland Twist Drill Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Standard Tool Co.  
Union Twist Drill Co.

#### Twist

Black Drill Co.  
Carboloy Co., Inc.  
Clark Equipment Co.  
Cleveland Twist Drill Co.  
Cogsdill Twist Drill Co., Inc.  
Firth-Sterling Steel Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Standard Tool Co.  
Super Tool Co.  
Union Twist Drill Co.

#### Wire

Cogsdill Twist Drill Co., Inc.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Standard Tool Co.  
Union Twist Drill Co.

## C-F POSITIONERS

*as far as the eye can see...*



through the light haze of this gigantic welding department extend triple rows of C-F Positioners. From this almost endless production line (the photograph is taken from the half-way point) each day come heretofore unheard of numbers of fabrication with all seams, joints and unions strongly and smoothly welded "downhand."

There are no handling problems or delays, for on C-F Positioners each welder positions his weldment for succeeding welds with a pushbutton control—can rotate it at any desired speed (360°) or tilt it to any angle up to 135° beyond horizontal.

Write for Bulletin WP-22.

CULLEN-FRIESTEDT CO., 1305 S. Kilbourn Ave., Chicago 23, U.S.A.



**DRIVES, Motorized Belt**

Cullman Wheel Co.  
Turner Uni-Drive Co.

**DUPLICATORS**

Rockford Machine Tool Co.

**DUST CONTROL SYSTEMS**

Pangborn Corp.

**ELECTRICAL EQUIPMENT**

General Electric Co.  
Westinghouse Electric & Mfg. Co.

**EMERY WHEELS**

See Grinding Wheels.

**EMERY WHEEL DRESSERS**

See Dressers, Grinding Wheel.

**ENGRAVING MACHINES**

Gorton, George, Mch. Co.

**EXTRACTORS, Screw**

Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.

**FACING MACHINE**

Ex-Cell-O Corp.

**FANS, Exhaust, Electric Ventilating**

Buffalo Forge Co.  
General Electric Co.  
Wagner Electric Co.

**FEEDS FOR PRESSES, Automatic**

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Heyman Co.

Peck, Stow & Wilcox Co.

S. & S. Machine Wks.

U. S. Tool Co., Inc.

V & O Press Co.

**FILES**

Chicago Wheel & Mfg. Co.

**Machine**

Oliver Instrument Co.

**Rotary**

Ford, M. A., Mfg. Co.

Haskins, R. G., Co.

Jarvis, Chas. L., Co.

Lewis, B. C., Mfg. Co., Inc.

Lincoln Park Industries, Inc.

Pratt & Whitney Co.

Stow Mfg. Co.

Strand, N. A., & Co.

**FILTERS, AIR**

United States Electrical Tool Co.

**FILTERS, OIL**

Briggs Clarifier Co.

**FILING MACHINES, Die, Etc.**

Ames, B. C., Co.

Continental Machines, Inc.

Grob Brothers

Illinois Tool Wks.

Jarvis, Chas. L., Co.

Oliver Instrument Co.

Stow Mfg. Co.

**FITTINGS, HYDRAULIC**

Watson-Stillman Co.

**FLEXIBLE COUPLINGS**

See Couplings, Flexible.

**FLEXIBLE SHAFT EQUIPMENT**

Dumore Co.

Haskins, R. G., Co.

Jarvis, Chas. L., Co.

Lewis, B. C., Mfg. Co., Inc.

Pratt & Whitney Co.

Stow Mfg. Co.

Strand, N. A., & Co.

Walker-Turner Co., Inc.

Wyzenbeek & Staff, Inc.

**FORGING (Upsetting) MOHS.**

Baldwin-Southwark Corp.

Hill Acme Co.

**FORGINGS, Drop**

Bethlehem Steel Co.

Drop Forging Association

Kropp Forge Co.

Williams, J. H., & Co.

**Hollow Bored**

American Hollow Boring Co.

Bethlehem Steel Co.

**Iron and Steel**

Bethlehem Steel Co.

Kropp Forge Co.

Morgan Engineering Co.

**Manganese, Bronze, Etc.**

Cramp Brass & Iron Foundries Div.

**Upset**

Bethlehem Steel Co.

Kropp Forge Co.

Williams, J. H., & Co.

**FORMING AND BENDING MOHS.**

Baldwin-Southwark Corp.

Bethlehem Steel Co.

Cincinnati Shaper Co.

Cleveland Punch & Shear Works Co.

Consolidated Mch. Tool Corp.

Hannifin Mfg. Co.

O'Neill-Irwin Mfg. Co.

Yoder Co.

**FORMING & STAMPING MOHS.**

Cincinnati Shaper Co.

U. S. Tool Co., Inc.

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Lake Shore Tool Works Div.

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Pratt & Whitney Co.

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Mahon, R. C., Co.

**FURNACES, Equipment for Loading**

Hydraulic Products Co.

# LOOK TO FENN FOR YOUR SPECIAL MACHINERY NEEDS

3 Generations of Fenns have specialized in building machinery. They have the designing and engineering skill backed by years of craftsmanship and experience.

## REDESIGNING MACHINERY for Profitable Post War Production

If you are thinking of redesigning old machines or building new ones, it is time to plan NOW.

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Fenn plants, located at Hartford and New Britain, will once again build special machinery at the close of the war. The men with the skill and experience to solve machine design and development problems, will be ready to work with you. Planning, blueprinting and engineering can be done now. Your inquiries involve no obligation.

Experienced Designers and Machine Builders With A Long-Time Reputation for Precision Workmanship. We invite your inquiries.

**THE FENN MANUFACTURING CO.**  
**HARTFORD, CONNECTICUT**

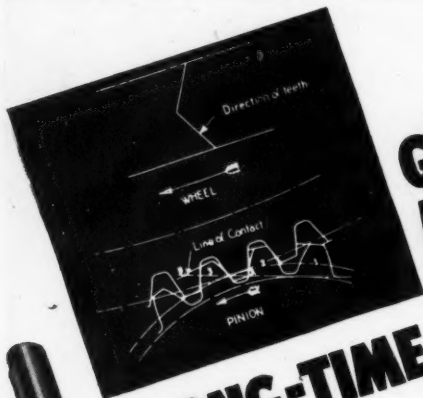


**Hardness**  
Leeds & Northrup Co.  
**Heat-Treating Electric**  
General Electric Co.  
Leeds & Northrup Co.  
Westinghouse Electric & Mfg. Co.  
**FURNITURE, Shop**  
Lee, E. O., & Son Co.  
Standard Pressed Steel Co.  
**GAGE BLOCKS**  
Aviation Tool & Gauge Co.  
Ponda Gage Co.  
Johansson Div., Ford Motor Co.  
Pratt & Whitney Co.  
Scherr, George, Co., Inc.  
Van Keuren Co.  
Webber Gage Co.  
**GAGE HANDLES**  
Vard, Inc.  
**GAGES, Comparator**  
Conitor Co.  
Federal Products Corp.  
Jones & Lamson Machine Co.  
Pratt & Whitney Co.  
Sheffield Corp.  
Woodworth, N. A., Co.  
**Depth**  
Brown & Sharpe Mfg. Co.

Federal Products Corp.  
Scherr, George, Co., Inc.  
Standard Gage Co., Inc.  
Starrett, L. S., Co.  
**Dial**  
Ames, B. C., Co.  
Brown & Sharpe Mfg. Co.  
Federal Products Corp.  
Scherr, George, Co., Inc.  
Sheffield Corp.  
Standard Gage Co., Inc.  
Starrett, L. S., Co.  
Trico Products Corp.  
**Electric**  
Pratt & Whitney Co.  
**Height**  
Brown & Sharpe Mfg. Co.  
Scherr, George, Co., Inc.  
Standard Gage Co.  
Starrett, L. S., Co.  
**Plug, Ring and Snap**  
Allen Gauge & Tool Co.  
American Gauge Co.  
Axelson Mfg. Co.  
Aviation Tool & Gauge Co.  
Brown & Sharpe Mfg. Co.  
Carboloy Co., Inc.  
Detroit Tap & Tool Co.  
Ex-Cell-O Corp.

Federal Products Corp.  
Firth-Sterling Steel Co.  
Greenfield Tap & Die Corp.  
Haynes Stellite Co.  
Kennametal, Inc.  
Lincoln Park Industries, Inc.  
Merz Engineering Co.  
Morse Twist Drill & Machine Co.  
Pipe Machinery Co.  
Pratt & Whitney Co.  
Quality Tool & Die Co.  
Scherr, George, Co., Inc.  
Sheffield Corp.  
Standard Gauge Co., Inc.  
Starrett, L. S., Co.  
Van Keuren Co.  
Vard, Inc.  
Vincor Corp.  
Woodworth, N. A., Co.  
**Surface**  
Brown & Sharpe Mfg. Co.  
Columbus Die, Tool & Mch. Co.  
Standard Gage Co., Inc.  
Starrett, L. S., Co.  
**Taper**  
Brown & Sharpe Mfg. Co.  
Johansson Div., Ford Motor Co.  
Pratt & Whitney Co.  
Sheffield Corp.  
Standard Gauge Co., Inc.

Starrett, L. S., Co.  
Vard, Inc.  
**Thread**  
Allen Gear & Tool Co.  
American Gauge Co.  
Axelson Mfg. Co.  
Bath, John, & Co., Inc.  
Brown & Sharpe Mfg. Co.  
Detroit Tap & Tool Co.  
Federal Products Corp.  
Greenfield Tap & Die Corp.  
Hanson-Whitney Machine Co.  
Jones & Lamson Machine Co.  
Lincoln Park Industries, Inc.  
Merz Engineering Co.  
Pipe Machinery Co.  
Pratt & Whitney Co.  
Quality Tool & Die Co.  
Sheffield Corp.  
Sossner Tap & Tool Corp.  
Starrett, L. S., Co.  
Vard, Inc.  
Woodworth, N. A., Co.  
**GASKETS**  
Garlock Packing Co.  
Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.  
**GEAR BLANKS, Non-Metallic**  
Braun Gear Co.  
Ganschow Gear Co.  
General Electric Co.  
Westinghouse Elec. & Mfg. Co.  
**GEAR BURNISHING MACHINES**  
Fellows Gear Shaper Co.  
Michigan Tool Co.  
**GEAR CHECKING INSTRUMENTS AND EQUIPMENT**  
Brown & Sharpe Mfg. Co.  
Fellows Gear Shaper Co.  
Gleason Works  
Illinois Tool Wks.  
Michigan Tool Co.  
National Broach & Mch. Co.  
Pratt & Whitney Co.  
**GEAR CUTTING MACHINES, Bevel (Generator)**  
Bilgram Gear & Machine Wks.  
Gleason Works  
**(Rotary Cutter)**  
Newark Gear Cutting Machine Co.  
Producto Machine Co.  
Waltham Mch. Wks.  
**GEAR CUTTING MACHINES, Helical and Spur (Hob)**  
Barber-Colman Co.  
Lees-Bradner Co.  
Michigan Tool Co.  
Newark Gear Cutting Machine Co.  
New Jersey Gear & Mfg. Co.  
Triplex Machine Tool Corp.  
**(Shaper or Planer Type)**  
Farrel-Birmingham Co., Inc.  
Fellows Gear Shaper Co.  
National Tool Co.  
**GEAR CUTTING MACHINES, Spiral-Bevel**  
Gleason Works  
**GEAR CUTTING MACHINES, Worm and Worm Wheels**  
Barber-Colman Co.  
Fellows Gear Shaper Co.  
**(Straight and Hourglass Type)**  
Lees-Bradner Co.  
Michigan Tool Co.  
New Jersey Gear & Mfg. Co.  
Producto Machine Co.  
**GEAR FINISHING MACHINES**  
Fellows Gear Shaper Co.  
Michigan Tool Co.  
**GEAR GRINDING MACHINES**  
Fitchburg Grinding Mch. Corp.  
Gleason Works  
Pratt & Whitney Co.  
**GEAR HARDENING MACHINES**  
Fellows Gear Shaper Co.  
Gleason Works  
**GEAR LAPPING MACHINES**  
Fellows Gear Shaper Co.  
Gleason Works  
Michigan Tool Co.  
National Broach & Mch. Co.  
**GEAR MOTORS**  
See Speed Reducers.  
**GEAR SHAVING MACHINES**  
Fellows Gear Shaper Co.  
National Broach & Mch. Co.  
**GEAR TESTING MACHINERY**  
Baldwin-Southwark Corp.  
Brown & Sharpe Mfg. Co.  
Farrel-Birmingham Co., Inc.  
Fellows Gear Shaper Co.  
Lees-Bradner Co.  
National Tool Co.  
Newark Gear Cutting Machine Co.  
Pratt & Whitney Co.  
Scherr, George Co., Inc.  
Vincor Corp.  
**GEAR TOOTH GRINDING MCHS.**  
Gear Grinding Machine Co.  
Lees-Bradner Co.  
Pratt & Whitney Co.  
**GEARS, Cut**  
Atlantic Gear Works, Inc.  
Bausch Machine Tool Co.  
Bethlehem Steel Co.  
Bilgram Gear & Machine Works  
Boston Gear Works, Inc.  
Braun Gear Co.  
Cincinnati Gear Co.  
Cleveland Works & Gear Co.  
Detroit Bevel Gear Co.



**Farrel-Birmingham**

Dieffendorf Gear Corp.  
Dodge Mfg. Corp.  
Earle Gear & Mch. Co.  
Fairfield Mfg. Co.  
Farrel-Birmingham Co., Inc.  
Fellows Gear Shaper Co.  
Foote Bros. Gear & Machine Corp.  
Ganschow Gear Co.  
General Electric Co.  
Gleason Works  
Grant Gear Works, Inc.  
Hartford Special Mch. Co.  
James, D. O., Mfg. Co.  
Lees-Bradner Co.  
Massachusetts Gear & Tool Co.  
Meisel Press Mfg. Co.  
Michigan Tool Co.  
Newark Gear Cutting Machine Co.  
New Jersey Gear & Mfg. Co.  
Ohio Gear Co.  
Perkins Mch. & Gear Co.  
Philadelphia Gear Works  
Pittsburgh Gear & Machine Co.  
Sier-Bath Co.  
Stahl Gear & Machine Co.  
Taylor Mch. Co.  
Vard, Inc.  
Westinghouse Electric & Mfg. Co.

#### Molded

Dodge Mfg. Co.  
Foote Bros. Gear & Machine Corp.  
Philadelphia Gear Works  
Westinghouse Electric & Mfg. Co.

#### Rawhide and Non-Metallic

Atlantic Gear Works, Inc.  
Boston Gear Works, Inc.  
Braun Gear Co.  
Cincinnati Gear Co.  
Dieffendorf Gear Corp.  
Earle Gear & Mch. Co.  
Foote Bros. Gear & Machine Corp.  
Ganschow Gear Co.  
General Electric Co.  
Grant Gear Works, Inc.  
Hartford Special Mch. Co.  
James, D. O., Mfg. Co.  
Massachusetts Gear & Tool Co.  
Meisel Press Mfg. Co.  
Philadelphia Gear Works  
Pittsburgh Gear & Machine Co.  
Stahl Gear & Machine Co.  
Taylor Mch. Co.  
Westinghouse Electric & Mfg. Co.

#### GENERATORS, ELECTRIC

General Electric Co.  
Janette Mfg. Co.  
Master Electric Co.  
Reliance Electric & Mfg. Co.  
Westinghouse Electric & Mfg. Co.

#### GOGGLES

American Optical Co.

#### GRADUATING MACHINES

Gorton, George, Mch. Co.  
Noble & Westbrook Mfg. Co.

#### GREASE

Cities Service Oil Co.  
Fiske Brothers Refining Co.  
(Lubriplate Div.).  
Gulf Oil Corp.  
Shell Oil Co., Inc.  
Standard Oil Co. (Indiana).  
Sun Oil Co.  
Texas Co.  
Tide Water Associated Oil Co.

#### GRINDERS, Carbide Tool

Baldor Electric Co.  
Oliver Instrument Co.  
Sundstrand Mch. Tool Co.

#### Die and Mold

Consolidated Mch. Tool Corp.  
Dumore Co.  
Haskins, R. G., Co.  
Pratt & Whitney Co.  
Stow Mfg. Co.

Oilstone, for Woodworking Tools  
Mummert-Dixon Co.

#### Pneumatic

Ingersoll-Rand Co.  
Madison-Kipp Corp.  
Onarud Machine Works  
Rotor Tool Co.

#### Portable Electric and Toolpost

Chicago Wheel & Mfg. Co.  
deSanno, A. P., & Son, Inc.  
Dumore Co.  
Haskins, R. G., Co.  
Jarvis, Chas. L., Co.  
Schauer Machine Co.  
Skilsaw, Inc.

#### GRINDING MACHINES,

##### Abrasive Belt

Continental Machines, Inc.  
Delta Mfg. Co.  
Hill Acme Co.  
Mattison Mch. Wks.  
Porter-Cable Machine Co.  
Production Machine Co.  
Walker-Turner Co., Inc.  
Walls Sales Corp.

##### Bench

Atlas Press Co.  
Delta Mfg. Co.  
Hardinge Brothers, Inc.  
Rivett Lathe & Grinder, Inc.  
Ryerson, Joseph T., & Son, Inc.  
Schauer Machine Co.  
Walker-Turner Co., Inc.

##### Broach

Gear Grinding Machine Co.

##### Camshaft

Landis Tool Co.  
Norton Co.

# NOW YOU CAN DRILL HARDENED STEEL



## with "HARDSTEEL" Drills

These are just a few of the many uses for "HARDSTEEL" drills — the drills that drill steel hardened by any method without annealing.

1. Drill holes in full hardened dies.
2. Drill holes in armor plate.
3. Remove broken set screws on a drill press.
4. Start holes in case hardened parts.
5. Enlarging holes in hardened parts to accommodate last minute changes.
6. Drill spring steel after tempering.
7. Drill parts after hardening to avoid warping or distortion.
8. Drill production parts after hardening to speed matching at assembly.
9. Drill work-hardening materials.
10. With a slight change in point grinding, drill hard carbon and plastics.

To save time and speed production on dozens of jobs, all you need are a drill press, a "HARDSTEEL" drill and the "know-how" given in detail in the "HARDSTEEL" Operators Manual. It tells recommended speeds, how to grind these drills on an ordinary wheel, when to use coolants, how to use drills for countersinking and counterboring and a wealth of similar information. Write for your copy today.



**"YOU HARDEN IT —  
WE'LL DRILL IT"**

**BLACK DRILL CO. • Division of BLACK INDUSTRIES**  
1400 EAST 222nd STREET • CLEVELAND 17, OHIO

# "HARDSTEEL"

DRILLS • TOOL BITS • SPECIAL TOOLS

#### Cemented Carbide Tool

Carboloy Co., Inc.  
Ex-Cell-O Corp.  
Oliver Instrument Co.  
Wesson Co.

#### Centerless

Cincinnati Grinders, Inc.

#### Chaser, or Die

Eastern Mch. Screw Corp.  
Fitchburg Grinding Mch. Corp.  
Geometric Tool Co.  
Landis Tool Co.

#### Chuckling

Bryant Chuckling Grinder Co.  
Fitchburg Grinding Mch. Corp.

#### Crankshaft

Landis Tool Co.  
Norton Co.

#### Cylinder

Bryant Chuckling Grinder Co.  
Heald Machine Co.  
Landis Tool Co.

#### Cylindrical

Arter Grinding Machine Co.  
Brown & Sharpe Mfg. Co.  
Cincinnati Grinders, Inc.  
Fitchburg Grinding Mch. Corp.  
Landis Tool Co.  
Modern Tool Wks. (Cons. Mch. Tool Corp.)  
Morse Twist Drill & Mch. Co.  
Norton Co.  
Pratt & Whitney Co.  
Rivett Lathe & Grinder, Inc.  
Thompson Grinder Co.

#### Disc

Bealy, Chas. H., & Co.  
Gardner Machine Co.  
Hanchett Mfg. Co.  
Porter-Cable Machine Co.  
Production Mch. Co.

#### Drill

Delta Mfg. Co.  
Gallmeyer & Livingston Co.  
Oliver Instrument Co.  
Sellers, Wm., & Co., Inc.  
Union Twist Drill Co.

#### Face

Abrasive Mch. Tool Co.

Diamond Machine Co.  
Hanchett Mfg. Co.  
Oliver Instrument Co.

#### Flexible Shaft

See Flexible Shaft Equipment.

#### Gear Teeth

National Tool Co.

#### For Sharpening Turning and Planing Tools

Delta Mfg. Co.  
General Machinery Corp.  
Oliver Instrument Co.  
Onsrud Machine Works, Inc.  
Production Mch. Co.  
Sellers, Wm., & Co., Inc.  
(Machine Ground)  
Walker, O. S., Co., Inc.  
Waltham Mch. Wks.

#### Internal

Bryant Chuckling Grinder Co.  
Heald Machine Co.  
Landis Tool Co.  
Modern Tool Wks. (Cons. Mch. Tool Corp.)  
Rivett Lathe & Grinder, Inc.  
Wicaco Machine Corp.

#### Jig

Moore Special Tool Co., Inc.

#### Knife and Shear Blade

Hanchett Mfg. Co.  
Hill Acme Co.

#### Piston Ring

Arter Grinding Machine Co.  
Bridgeport Safety Emery Wheel Co., Inc.  
Heald Machine Co.

#### Profile

Boyar-Schults Corp.

#### Pulley

Abrasive Mch. Tool Co.

#### Radial, Ball Race, Etc.

Landis Tool Co.

#### Radius, Link

Consolidated Mch. Tool Corp.  
Sundstrand Mch. Tool Co.

#### Ring Wheel

Bealy, Chas. H., & Co.  
Bridgeport Safety Emery Wheel Co., Inc.  
Gardner Machine Co.

#### Roll

Farrel-Birmingham Co., Inc.  
Landis Tool Co.  
Norton Co.

#### Spline

Fitchburg Grinding Machine Corp.  
Gear Grinding Machine Co.

#### Surface

Abrasive Mch. Tool Co.  
Arter Grinding Machine Co.  
Blanchard Mch. Co.  
Brown & Sharpe Mfg. Co.  
Continental Machines, Inc.  
Foote-Burt Co.  
Gallmeyer & Livingston Co.  
Gardner Mch. Co.  
Hanchett Mfg. Co.  
Heald Machine Co.  
Hill Acme Co.  
Leach, H., Machinery Co.  
Mattison Machine Works.  
Norton Co.  
Pratt & Whitney Co.  
Producto Machine Co.  
Robot Machinery Co.  
Sommer & Adams Co.  
Thompson Grinder Co.  
Walker, O. S., Co., Inc.  
Williams-White & Co.

#### Swing Frame

Jefferson Machine Tool Co.  
Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.

#### Tap

Cleveland Tool Engineering Co.  
Ex-Cell-O Corp.  
Jones & Lamson Mch. Co.

#### Thread

Ex-Cell-O Corp.  
Jones & Lamson Mch. Co.

#### Universal, For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co.  
Brown & Sharpe Mfg. Co.  
Cincinnati Milling Mch. Co.  
Continental Machines, Inc.  
Fellows Gear Shaper Co.  
(Helical Gear Shaper Cutters).  
Fitchburg Grinding Mch. Corp.  
Gallmeyer & Livingston Co.  
Ingersoll Milling Mch. Co.  
Landis Tool Co.  
LeBlond, R. K., Mch. Tool Co.  
Lee, K. O., & Son Co.  
Norton Co.  
Oliver Instrument Co.  
Pratt & Whitney Co.  
Thompson Grinder Co.  
Union Twist Drill Co.

#### Worm

Gear Grinding Machine Co.  
Jones & Lamson Mch. Co.  
Pratt & Whitney Co.

#### GRINDING WHEELS

Abrasive Co.  
Bealy, Chas. H., & Co.  
Blanchard Mfg. Co.  
Bridgeport Safety Emery Wheel Co., Inc.  
Carborundum Co.  
Chicago Wheel & Mfg. Co.  
Cortland Grinding Wheels Corp.  
deSanno, A. P., & Son, Inc.  
Felter Mfg. Co.  
Manhattan Rubber Mfg. Div.,  
Raybestos-Manhattan, Inc.  
Norton Co.  
Vitrified Wheel Co.

#### HAMMERS, Drop

Chambersburg Engineering Co.  
Erie Foundry Co.  
Morgan Engineering Co.  
Williams-White & Co.

#### Pneumatic

Madison-Kipp Corp.

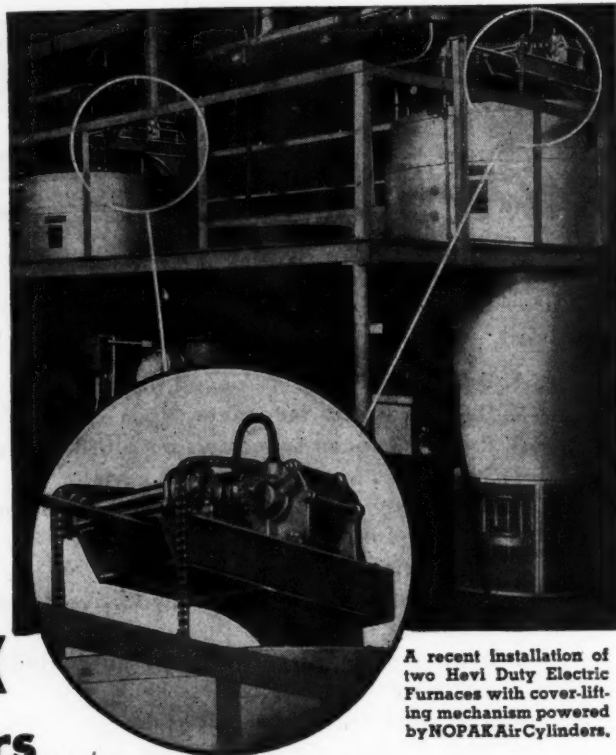
#### Power

Quickwork-Whiting Div. of Whiting Corp.

#### Soft

Chambersburg Engineering Co.  
S. & H. Soft Hammer Products Co.

# 1000 lb. Furnace Covers— an EASY LIFT with NOPAK Cylinders



A recent installation of two Hevi Duty Electric Furnaces with cover-lifting mechanism powered by NOPAK Air Cylinders.

Because Hevi Duty Electric Pit-Type Heat Treating Furnaces are charged from the top, the 1000 lb. steel cover is lifted and swung aside for every charge. To save time between charges, Hevi-Duty design engineers devised a simple, roller-chain lifting mechanism featuring ingenious 3-point cover suspension. Lifting power is supplied by a 6" Model A NOPAK Air Cylinder with 6" stroke, mounted directly on the swinging boom.

The positive-acting air cylinder, controlled by a NOPAK 4-Way Valve, lifts or lowers the heavy cover gently and accurately in a matter of seconds, conserving valuable heat-treating time.

This Hevi Duty solution to a heavy-duty lifting problem may suggest how NOPAK Cylinders may be used for lifting, pushing, pulling, positioning or clamping operations in your plant.

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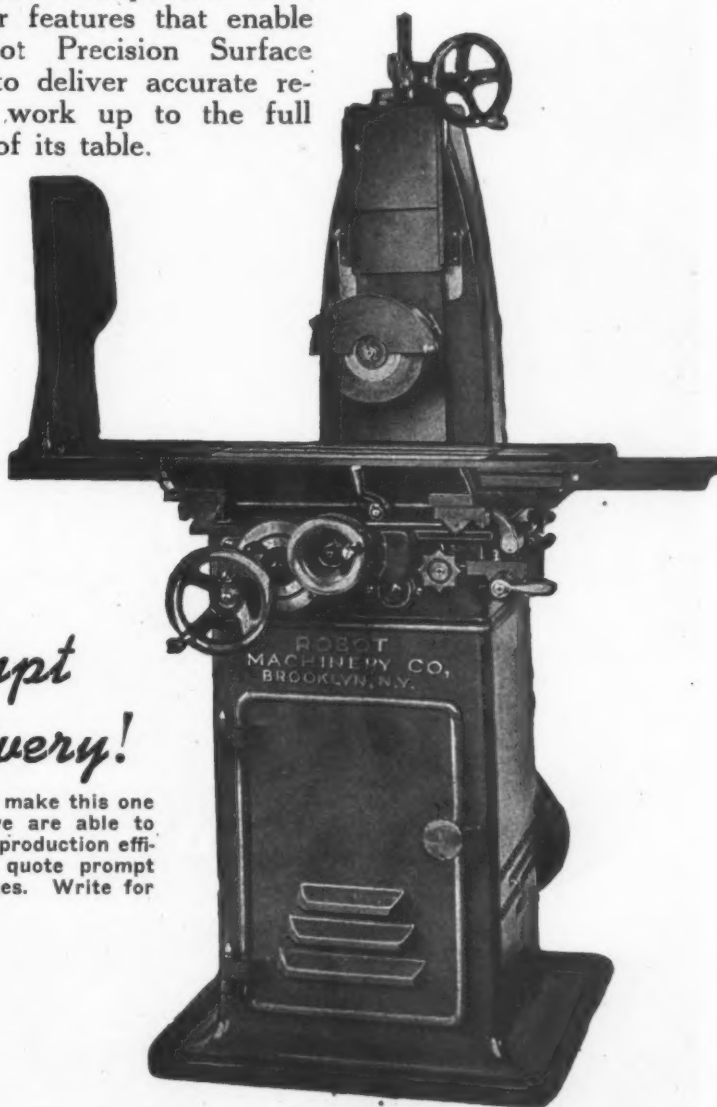
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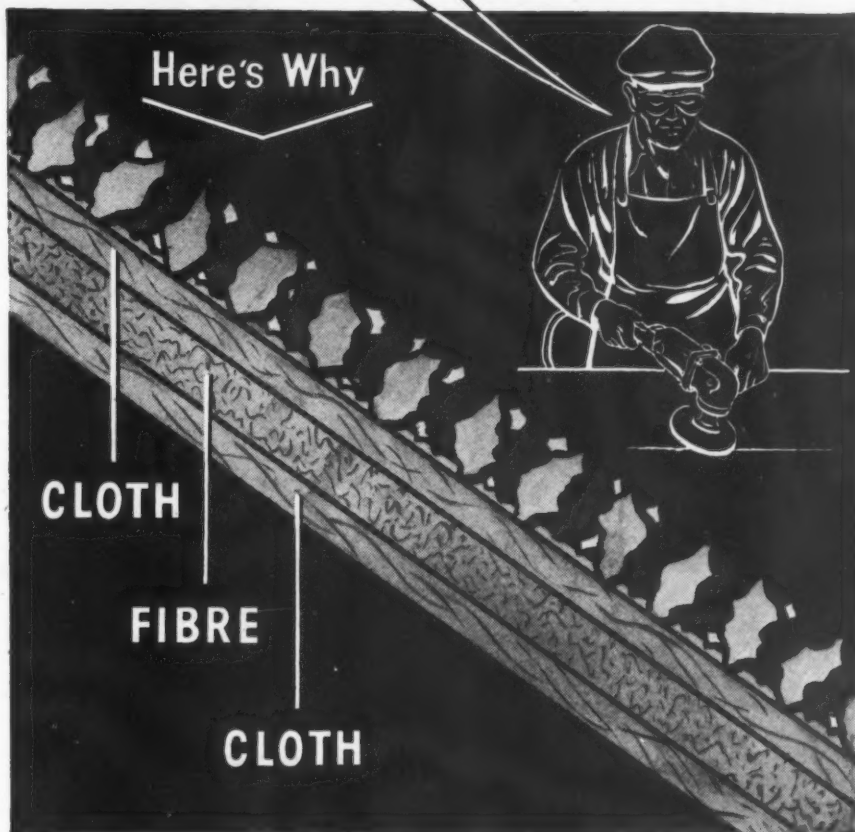
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Tide Water Associated Oil Co.

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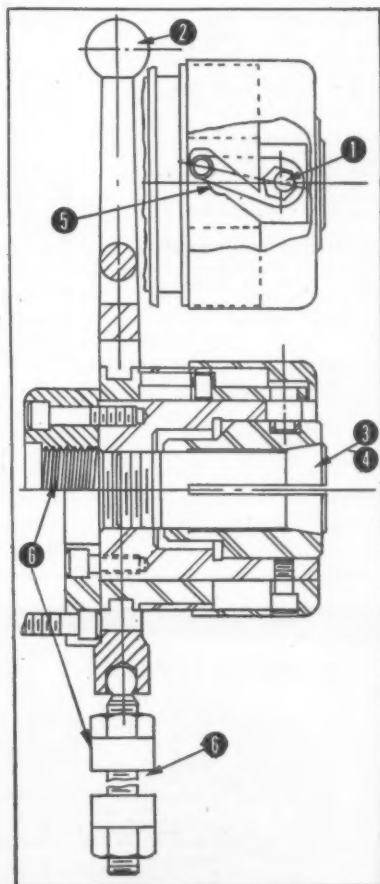
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**PHOSPHOR BRONZE—See Bronze.**

**PILLOW BLOCKS**

Hill Acme Co.  
Norma-Hoffmann Bearings Corp.  
S K F Industries, Inc.  
Standard Pressed Steel Co.

**PIPE BEVELING MACHINE,**

Oxyacetylene  
H. & M. Pipe Beveling Mch. Co.

**PIPE, BRASS AND COPPER**

American Brass Co.

**PIPE CUTTING AND  
THREADING MACHINES**

Foot-Burt Co.  
Landis Mch. Co., Inc.  
Murchey Mch. Tool Co.  
Oster Manufacturing Co.  
Peerless Machine Co.

**PIPE, STEEL**

Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
National Tube Co. (U. S. Steel  
Corp. Div.).  
Ryerson, Joseph T., & Son, Inc.

**PIPE TONGS**

Williams, J. H., & Co.

**PLAHER ATTACHMENTS**

Cincinnati Planer Co.  
Consolidated Mch. Tool Corp.  
Hanson-Whitney Mch. Co.  
Rockford Machine Tool Co.

**PLANERS**

Baldwin-Southwark Corp.  
Cincinnati Planer Co.  
Consolidated Mch. Tool Corp.  
(Incl. Plate, Rotary and  
Crank Types).  
Liberty Planers  
Rockford Machine Tool Co.  
Sellers, Wm., & Co., Inc.

**Openside**

Cincinnati Planer Co.  
Liberty Planers  
Rockford Machine Tool Co.

**PLATE ROLLS**

Baldwin-Southwark Corp.  
Bethlehem Steel Corp.  
Cleveland Punch & Shear Wks., Co.  
Consolidated Mch. Tool Corp.  
Hannifin Mfg. Co.  
Ryerson, Joseph T., & Son, Inc.  
Schatz Mfg. Co.  
Williams-White & Co.

**PLATES, Surface**

Brown & Sharpe Mfg. Co.  
Jones Machine Tool Wks., Inc.  
Rotor Tool Co.  
Taft-Peirce Mfg. Co.  
U. S. Tool Company, Inc.

**PNEUMATIC EQUIPMENT**

Anker-Holth Mfg. Co.  
Hanna Engineering Works  
Hannifin Mfg. Co.  
Ingersoll-Rand Co.  
Logansport Machine, Inc.  
Onarud Machine Works, Inc.

**POLISHING LATHES and Machines**

Bealy, Chas. H., & Co.  
Bridgeport Safety Emery Wheel  
Co., Inc.  
Continental Machines, Inc.  
Gardner Machine Co.  
Production Mch. Co.  
Sundstrand Mch. Tool Co.

**POLISHING TOOLS, Portable**

Jarvis, Chas. L., Co.  
Stow Mfg. Co.  
Strand, N. A., & Co.

**POLISHING WHEELS**

Chicago Wheel & Mfg. Co.

**POWDERED METALS**

General Metals Powder Co.

**PRESSES**

**Arbor**

Baldwin-Southwark Corp.  
Dake Engine Co.  
Famco Machine Co.  
Farquhar, A. B., Co., Ltd.  
General Mfg. Co.  
Hannifin Mfg. Co.  
Logansport Machines, Inc.  
Sheldon Mch. Co.  
Watson-Stillman Co.  
Wilson, K. R.

**Broaching**

American Broach & Mch. Co.  
General Mfg. Co.  
Lapointe Machine Tool Co.  
Peck, Stow & Wilcox Co.  
V & O Press Co.  
Watson-Stillman Co.

**Extrusion**

Hydropress Co., Inc.  
Lake Erie Engineering Corp.  
Watson-Stillman Co.

**Foot**

Baird Machine Co.  
Etna Machine Co.  
Famco Machine Co.  
Niagara Machine & Tool Wks.  
Peck, Stow & Wilcox Co.  
V & O Press Co.

**Forging**

Baldwin-Southwark Corp.  
Bethlehem Steel Co.  
Clearing Mch. Co.  
Cleveland Punch & Shear Works Co.  
Erie Foundry Co.  
Farquhar, A. B., Co.  
Henry & Wright Mfg. Co.  
Hydropress Co., Inc.  
Lake Erie Engineering Corp.  
Morgan Engineering Co.  
Niagara Machine & Tool Wks.  
Peck, Stow & Wilcox Co.  
Schatz Mfg. Co.  
V & O Press Co.  
Verson Allsteel Press Co.  
Watson-Stillman Co.  
Williams-White & Co.  
Zeh & Hahnemann Co.

**Hydraulic**

American Broach & Mch. Co.  
Baldwin-Southwark Corp.  
Bethlehem Steel Co.  
Birdsboro Steel Fdry. & Mch. Co.  
Clearing Mch. Co.  
Dake Engine Co.  
Denison Engineering Co.  
Diamond Machine Co.  
Erie Foundry Co.  
Farrel-Birmingham Co., Inc.  
Farquhar, A. B., Co., Ltd.  
Francis, Chas., E., Co.  
Hannifin Mfg. Co.  
Hydropress Co., Inc.  
Lake Erie Engineering Corp.  
Lapointe Machine Tool Co.  
Morgan Engineering Co.  
Verson Allsteel Press Co.  
Watson-Stillman Co.  
Williams-White & Co.  
Wilson, K. R.  
Wood, R. D., Co.

**Percussion**

Wilson, K. R.

**Screw**

General Mfg. Co.  
Niagara Machine & Tool Wks.  
Schatz Mfg. Co.  
Zeh & Hahnemann Co.

**Sheet Metal Working**

Baldwin-Southwark Corp.

Cincinnati Shaper Co.  
Clearing Mch. Co.  
Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.  
Famco Machine Co.  
Farquhar, A. B., Co., Ltd.  
Henry & Wright Mfg. Co.  
I. & J. Press Corp.  
Lake Erie Engineering Corp.  
Niagara Machine & Tool Wks.  
Peck, Stow & Wilcox Co.  
Quickwork-Whiting Div. of Whiting  
Corp.  
Schatz Mfg. Co.  
Steelweld Mchry. Div. of Cleveland  
Crane & Engrg. Co.  
V & O Press Co.  
Verson Allsteel Press Co.  
Watson-Stillman Co.  
Zeh & Hahnemann Co.

**Straightening**

Baldwin-Southwark Corp.  
Consolidated Mch. Tool Corp.  
Farquhar, A. B., Co., Ltd.  
General Mfg. Co.  
Hannifin Mfg. Co.  
Jones Machine Tool Wks., Inc.  
Morgan Engineering Co.  
Schatz Mfg. Co.  
Springfield Mch. Tool Co.  
Watson-Stillman Co.  
Williams-White & Co.

**PROFILING MACHINES**

Consolidated Mch. Tool Corp.  
Frew Machine Co.  
Gorton, George, Mch. Co.  
Leland-Gifford Co.  
Mory Machinery Co., Inc.  
Onarud Machine Works, Inc.  
Pratt & Whitney Co.  
Reed-Prentice Corp.  
Thompson, Earl W., Mfg. Co.

**PULLEYS**

Boston Gear Works, Inc.  
Continental Machines, Inc.  
Foot Bros. Gear & Machine Corp.  
Hill Acme Co.  
Sellers, Wm., & Co., Inc.

**Friction Clutch**

Brown & Sharpe Mfg. Co.  
Dodge Mfg. Corp.  
Hill Acme Co.

**PUMPS, Coolant, Lubricant and Oil**

Brown & Sharpe Mfg. Co.  
Gray Mills Co.  
Ingersoll-Rand Co.  
Logansport Machine, Inc.  
Ruthman Machinery Co.  
Tuthill Pump Co.  
Viking Pump Co.

**Hydraulic**

Anker-Holth Mfg. Co.  
Baldwin-Southwark Corp.  
Barnes, John S., Corp.  
Bethlehem Steel Co.  
Brown & Sharpe Mfg. Co.  
Hydropress Co., Inc.  
Ingersoll-Rand Co.  
Lapointe Machine Tool Co.  
Sundstrand Mch. Tool Co.  
Tuthill Pump Co.  
Viking Pump Co.  
Watson-Stillman Co.  
Worthington Pump & Mchry. Corp.

**Pneumatic**

Ingersoll-Rand Co.

**Rotary**

Brown & Sharpe Mfg. Co.  
Tuthill Pump Co.  
Viking Pump Co.  
Worthington Pump & Mchry. Corp.

**PUNCHES AND DIES**

See Dies, Sheet Metal, etc.

**PUNCHES, CENTERING**

Cleveland Punch & Shear Works Co.

**PUNCHING MACHINERY**

Buffalo Forge Co.  
Cincinnati Shaper Co.  
Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.  
Hannifin Mfg. Co.  
Niagara Machine & Tool Wks.  
Peck, Stow & Wilcox Co.  
Ryerson, Joseph T., & Son, Inc.  
Schatz Mfg. Co.  
Steelweld Mchry. Div. of Cleveland  
Crane & Engrg. Co.  
Watson-Stillman Co.  
Wiedemann Machine Co.  
Williams-White & Co.

**PUNCHING AND RIVETING  
MACHINES**

Hannifin Mfg. Co.

**PYROMETERS**

Leeds & Northrup Co.  
Shore Instrument & Mfg. Co.

**RACK CUTTING MACHINES  
AND ATTACHMENTS**

Gould & Eberhardt

**RACKS, GEAR, CUT**

Atlantic Gear Works, Inc.  
Boston Gear Works, Inc.  
Brown & Sharpe Mfg. Co.  
Fellows Gear Shaper Co.  
Foot Bros. Gear & Machine Corp.  
Hartford Special Mchry. Co.  
James, D. O., Mfg. Co.  
Massachusetts Gear & Tool Co.  
Meisel Press Mfg. Co.  
Philadelphia Gear Works  
Shah Gear & Machine Co.

**REAMER HOLDERS**

Gairing Tool Co.  
Gisholt Machine Co.  
Landis Mch. Co., Inc.  
Lipe-Railway Corporation  
McCroskey Tool Corp.  
Scully-Jones & Co.  
Warner & Swasey Co.

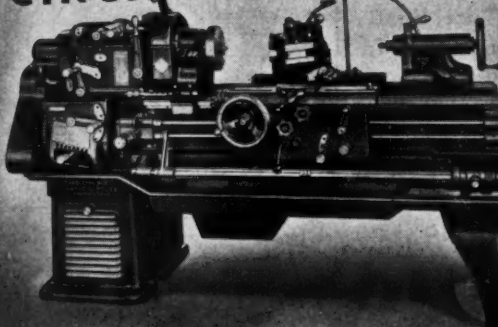
**REAMERS**

Barber-Colman Co.  
Black Drill Co.  
Butterfield Div. Union Twist Drill  
Co.  
Carboloy Co., Inc.  
Cleveland Twist Drill Co.  
Columbus Die, Tool & Mch. Co.  
Davis Boring Tool Div.  
Ex-Cell-O Corporation  
Firth-Sterling Steel Co.  
Gairing Tool Co.  
Gammons-Hogland Co.  
Gisholt Machine Co.  
Greenfield Tap & Die Corp.  
Haynes Stellite Co.  
Illinois Tool Wks.  
Lake Shore Tool Works Div.  
Lipe-Railway Corporation  
Machinists Tool Grinding Co.  
McCroskey Tool Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Super Tool Co.  
Tungsten Carbide Tool Co.  
Union Twist Drill Co.  
Wetmore Reamer Co.

**Adjustable**

Barber-Colman Co.  
Carboloy Co., Inc.  
Cleveland Twist Drill Co.  
Cogadill Twist Drill Co., Inc.  
Davis Boring Tool Div.  
Ex-Cell-O Corporation  
Firth-Sterling Steel Co.  
Gairing Tool Co.  
Gisholt Machine Co.  
Greenfield Tap & Die Corp.  
Madison Mfg. Co.  
McCroskey Tool Corp.  
Morse Twist Drill & Mch. Co.  
Pratt & Whitney Co.  
Rogers, John M., Tool Corp.  
Taft-Peirce Mfg. Co.

**CINCINNATI LATHES**



... prove their Ruggedness  
machining Today's Tough Metals

Tougher, lightweight metals—born of war needs  
and promising increased application in the coming  
peace—give any lathe a severe test. CINCINNATI  
LATHES meet the test! Under conditions of  
constant operation at top speed, Cincinnati rug-  
gedness assures high output and uniform accu-  
racy. Extra heavy bed and wide ways are designed  
to offer maximum resistance to all types of  
speeds and 32 to 96 feeds. Write for latest cata-  
log with full data.

★  
**THE  
CINCINNATI  
LATHE & TOOL  
COMPANY**  
DISNEY DRIVE  
OAKLEY,  
CINCINNATI, O.  
SPECIALISTS  
SINCE 1906





## The chipped teacup of the PATRIOTIC Mrs. Jones

**No matter who the guest**—Mrs. Jones brings out her chipped teacup with no embarrassment. On the contrary, with a thrill of pride.

Not very pretty, that chip. But it bears witness to the fact that Mrs. Jones has her nation's welfare at heart.

Mrs. Jones has given up all unnecessary spending for the duration. By doing *without*—she is helping to fight inflation.

Maybe she doesn't know all the complicated theories about inflation. But she does know that her government has asked her *not to spend*.

So Mrs. Jones is making all the old things do . . . not only that teacup. She's wearing her clothes for another year—and another. She's not competing with her neighbors for merchandise of any sort.

And the dollars she's not spending now are safely put away (and earning interest) for the peacetime years ahead. *Then* those dollars will buy things that can't be had for any price today.

If we all are like Mrs. Jones, there will be no inflation with skyrocket prices. If

we all are like her, dangerous Black Markets cannot exist.

A chipped teacup stands for all that . . . for a *sound, secure* U. S. A.

### 7 RULES FOR PATRIOTIC AMERICANS TO REMEMBER EVERY DAY

**1.** Buy only what you *absolutely* need. Make the article you have last longer by proper care. Avoid waste.

**2.** Pay no more than ceiling prices. Buy rationed goods only by exchanging stamps. (Rationing and ceiling prices are for your protection.)

**3.** Pay willingly any taxes that your country needs. (They are the cheapest way of paying for the war.)

**4.** Pay off your old debts—avoid making new ones.

**5.** Don't ask more money for the goods you sell or for the work you do. Higher prices come out of everybody's pocket—including yours.

**6.** Establish and maintain a savings account; maintain adequate life insurance.

**7.** Buy all the War Bonds you can—and hold 'em!

**HELP  
US  
KEEP**

**PRICES DOWN**

*Use it up . . . Wear it out . . . Make it do . . . Or do without*

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.

Standard Tool Co.  
Union Twist Drill Co.  
Wetmore Reamer Co.

#### Taper Pin

Butterfield Div. Union Twist Drill Co.  
Gammons-Hoagland Co.  
Greenfield Tap & Die Corp.  
Lipe-Rollway Corporation  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Standard Tool Co.  
Union Twist Drill Co.

**REAMING MACHINES**  
Van Norman Co.

#### RECORDING INSTRUMENTS

**For Counting**  
National Acme Co.

**For Electricity**  
General Electric Co.  
Leeds & Northrup Co.

**For Pressure**  
Leeds & Northrup Co.

**For Speed**  
Leeds & Northrup Co.

**For Temperature**  
Leeds & Northrup Co.

**REELS, Stock, Standard and Automatic**  
S & S Mch. Wks.  
U. S. Tool Company, Inc.

**REFRACORIES, Heat Treating Furnace**  
Norton Co.

**REGULATORS, Temperature**  
General Electric Co.  
Leeds & Northrup Co.

**REMOVERS, Japan, Enamel, Etc.**  
Oakite Products, Inc.

**RHEOSTATS**  
Allen-Bradley Co.  
General Electric Co.

**RIVET SETS**  
Bethlehem Steel Co.  
Cleveland Punch & Shear Works, Co.

**RIVETERS, Hydraulic**  
Bethlehem Steel Co.  
Hanna Engineering Works  
Hannifin Mfg. Co.  
Morgan Engineering Co.

**Pneumatic**  
Grant Mfg. & Mch. Co.  
Hanna Engineering Works  
Hannifin Mfg. Co.  
Ingersoll-Rand Co.  
Ryerson, Joseph T., & Son, Inc.  
Wood, R. D., Co.

**RIVETING MACHINES**  
Buffalo Forge Co.  
Grant Mfg. & Mch. Co.  
Hanna Engineering Works  
Hannifin Mfg. Co.  
Peck, Stow & Wilcox Co.  
Producto Machine Co.  
Williams-White & Co.

**RIVET MAKING MACHINES**  
Hill Acme Co.

**RIVETS**  
Hassall, John, Inc.  
Manufacturers Screw Products

**ROUTERS, Portable, Radial Arm, Turret Head, Etc.**  
Onsrud Machine Works, Inc.

**RULES, Steel**  
Brown & Sharpe Mfg. Co.  
Scherr, George, Co., Inc.  
Starrett, L. S., Co.

**RUST PREVENTIVE**  
Houghton, E. F., & Co.  
Oakite Products, Inc.  
Scherr, George, Co., Inc.

**SAFETY GUARDS For Punch Presses**  
Taylor-Shantz, Inc.

**SAND BLAST EQUIPMENT**  
See Blast Cleaning Equipment.

**SANDERS**  
Carborundum Co.  
Delta Mfg. Co.  
Ingersoll-Rand Co.  
Jarvis, Chas. L., Co.  
Jefferson Machine Tool Co.  
Porter-Cable Machine Co.  
Rotor Tool Co.  
Skilaw, Inc.  
Stow Mfg. Co.  
Sundstrand Mch. Tool Co.  
Walls Sales Corp.

**SAW BLADES, HACK**  
Armstrong-Blum Mfg. Co.  
Peerless Machine Co.  
Starrett, L. S., Co.

**SAW FILING MACHINES**  
Wardwell Mfg. Co.

**SAW SETTING MACHINES, Circular**  
Wardwell Mfg. Co.

**SAW SHARPENING MACHINES**  
Earle Gear & Mch. Co.  
Espan-Lucas Machine Works  
Huther Bros. Saw Mfg. Co., Inc.  
Peerless Machine Co.  
Scherr, George, Co., Inc.  
Wardwell Mfg. Co.

**SAWING MACHINES, Circular**  
Consolidated Mch. Tool Corp.  
Earle Gear & Mch. Co.  
Espan-Lucas Machine Works  
Etna Machine Co.

#### Friction

Ryerson, Joseph T., & Son, Inc.

#### Metal Cutting Band

Armstrong-Blum Mfg. Co.  
Avey Drilling Machine Co.  
Continental Machines, Inc.  
Delta Mfg. Co.  
Grob Brothers  
Huther Bros. Saw Mfg. Co., Inc.  
Ryerson, Joseph T., & Son, Inc.

#### Power Hack

Armstrong-Blum Mfg. Co.  
Peerless Machine Co.  
Ryerson, Joseph T., & Son, Inc.

#### Wood

Delta Mfg. Co.

#### SAWS, Circular Metal Cutting

Brown & Sharpe Mfg. Co.  
Consolidated Mch. Tool Corp.  
Espan-Lucas Machine Works  
Huther Bros. Saw Mfg. Co., Inc.  
Illinois Tool Wks.  
National Twist Drill & Tool Co.  
Peerless Machine Co.  
Standard Tool Co.  
Union Twist Drill Co.  
Walker-Turner Co., Inc.

#### Hole

Armstrong-Blum Mfg. Co.

#### Metal Cutting Band

Armstrong-Blum Mfg. Co.  
Delta Mfg. Co.  
DoAll Co., Inc.  
Huther Bros. Saw Mfg. Co., Inc.  
Ryerson, Joseph T., & Son, Inc.  
Starrett, L. S., Co.  
Tannewitz Works  
Walker-Turner Co., Inc.  
Wells Manufacturing Corp.

#### Portable Electric

Skilaw, Inc.

#### Screw Slotting

Barber-Colman Co.  
Brown & Sharpe Mfg. Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Standard Tool Co.  
Starrett, L. S., Co.  
Union Twist Drill Co.

**SCRAPERS, Hand and Power**  
Anderson Bros. Mfg. Co.

#### SCREW DRIVING AND NUT SETTING EQUIPMENT

Errington Mechanical Laboratory  
Haskins, R. G., Co.  
Ingersoll-Rand Co.  
Jarvis, Chas. L., Co.  
Miller, L. B., Co. (Flexible)  
Co., Inc.  
Proctor Safety Chuck Co.  
Stow Mfg. Co.  
Strand, N. A., & Co.

**SCREW MACHINES, Automatic, Single and Multiple Spindle**  
Brown & Sharpe Mfg. Co.  
Cleveland Automatic Machine Co.  
Cone Automatic Machine Co., Inc.  
Foote-Burt Co.  
Greenlee Bros. & Co.  
National Acme Co.  
New Britain-Gridley Mch. Div.,  
New Britain Machine Co.  
Scherr, George, Co., Inc.

#### SCREW MACHINES, Hand

See also Lathes, Turret.  
Acme Machine Tool Co.  
Bardons & Oliver, Inc.  
Brown & Sharpe Mfg. Co.  
Gisholt Mch. Co.  
Hardinge Brothers, Inc.  
Jones & Lamson Machine Co.  
Rivett Lathe & Grinder, Inc.  
Simmons Machine Tool Corp.  
Warner & Swasey Co.

#### SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc.  
Brown & Sharpe Mfg. Co.  
Cleveland Automatic Machine Co.  
Gisholt Mch. Co.  
Greenlee Bros. & Co.  
Jones & Lamson Machine Co.

Landis Mch. Co., Inc.  
Murchey Mch. & Tool Co.  
National Acme Co.  
New Britain-Gridley Mch. Div.,  
New Britain Machine Co.  
Potter & Johnston Machine Co.  
R & L Tools  
Warner & Swasey Co.

#### SCREW MACHINE WORK

Eastern Mch. Screw Corp.  
Morse Twist Drill & Mch. Co.  
National Acme Co.  
Standard Pressed Steel Co.  
Vard, Inc.  
Wicaco Machine Corp.

#### SCREW PLATES

Bealy, Chas. H., & Co.  
Butterfield Div. Union Twist Drill Co.  
Card, S. W., Mfg. Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
Pratt & Whitney Co.

#### SCREWS, Cap, Set, Safety Set and Machine

Allen Mfg. Co.  
American Screw Co.  
Central Screw Co.  
Chandler Products Corp.  
Continental Screw Co.  
Corbin Screw Co.  
General Screw Mfg. Co.  
Harper, H. M., Co.  
Holo-Krome Screw Corp.  
International Screw Co.  
Lamson & Sessions Co.  
Manufacturers Screw Products  
Milford Rivet & Machine Co.  
National Acme Co.  
National Screw & Mfg. Co.  
New England Screw Co.  
Parker, Chas., Co.  
Parker-Kalon Corp.  
Pawtucket Screw Co.  
Pheoll Mfg. Co.  
Reading Screw Co.  
Russell, Burdall & Ward Bolt & Nut Co.  
Scovil Mfg. Co.  
Southington Hardware Co.  
Standard Pressed Steel Co.  
Whitney Screw Corp.  
Wolverine Belt Co.

#### SCREWS, Self-Tapping Drive

Hassall, John, Inc.  
Manufacturers Screw Products  
Parker-Kalon Corp.

#### SCREWS, Thumb

American Screw Co.  
Manufacturers Screw Products  
Parker-Kalon Corp.  
Williams, J. H., & Co.

#### SEALS AND RETAINERS, Oil or Grease

Garlock Packing Co.  
Gits Bros. Mfg. Co.

#### SEAMLESS STEEL TUBING

See Tubing, Seamless Steel.

#### SECOND HAND MACHINERY, Etc.

Cincinnati Machinery & Supply Co.  
Eastern Machinery Co.  
Manuman Machinery Corp.  
General Machinery Corp.  
Interstate Machinery Co.  
Jefferson Machine Tool Co.  
Miles Machinery Co.  
Morey Mehry, Co., Inc.  
Simmons Machine Tool Corp.  
Wiggsworth Machinery Co.

#### SEPARATORS, Centrifugal Oil

National Acme Co.  
Tolhurst Centrifugal Div., American Machine & Metals, Inc.

#### SHAFTING, STEEL

Bethlehem Steel Co.  
National Tube Co. (U. S. Steel Corp., Div.)  
Ryerson, Joseph T., & Son, Inc.  
Standard Pressed Steel Co.  
Wyckoff Steel Co.

#### SHAFTS, FLEXIBLE

Haskins, R. G., Co.  
Jarvis, Chas. L., Co.  
Stow Mfg. Co.  
Strand, N. A., & Co.

#### Hollow Bored

American Hollow Boring Co.  
Bethlehem Steel Co.

#### Turning and Ground

Bethlehem Steel Co.  
Ryerson, Joseph T., & Son, Inc.

#### SHAPERS

American Tool Works Co.  
Atlas Press Co.  
Cincinnati Shaper Co.  
Hendey Machine Co.  
Machinery Mfg. Co.  
Onsrud Machine Works, Inc.  
Rockford Mch. Tool Co.  
Smith & Mills Co.

#### Vertical

Hanson-Whitney Mfg. Co.  
Jones Machine Tool Wks., Inc.  
Pratt & Whitney Co.  
Rhodes Manufacturing Co.  
Rockford Machine Tool Co.

#### Structural

Bethlehem Steel Co.  
Cramp Brass & Iron Foundries Div.

#### SHEARING MACHINERY

Bethlehem Steel Co.  
Buffalo Forge Co.  
Cincinnati Shaper Co.  
Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.  
Hannifin Mfg. Co.  
Hydropress Co., Inc.  
Morgan Engineering Co.  
Niagara Mch. & Tool Wks.  
O'Neill-Irwin Mfg. Co.  
Peck, Stow & Wilcox Co.  
Quickwork-Whiting Div. of Whiting Corp.  
Ryerson, Joseph T., & Son, Inc.  
Schatz Mfg. Co.  
Watson-Stillman Co.  
Williams-White & Co.  
Yoder Co.

#### SHEARS, Rotary

Brown & Sharpe Mfg. Co.  
Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.  
Niagara Mch. & Tool Wks.  
Peck, Stow & Wilcox Co.  
Quickwork-Whiting Div. of Whiting Corp.  
Ryerson, Joseph T., & Son, Inc.  
Schatz Mfg. Co.  
Union Twist Drill Co.  
Williams-White & Co.

#### Squaring

Cincinnati Shaper Co.  
Cleveland Punch & Shear Works Co.  
Consolidated Mch. Tool Corp.  
Niagara Mch. & Tool Wks.  
Peck, Stow & Wilcox Co.  
Schatz Mfg. Co.

#### SHEET METALS

American Brass Co.  
Bethlehem Steel Co.  
Ingersoll Steel & Disc Div.,  
Bore-Warner Corp.  
Ryerson, Joseph T., & Son, Inc.

#### SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Republic Steel Corp.  
Ryerson, Joseph T., & Son, Inc.

#### Perforated

Chicago Perforating Co.

**DRINKING EQUIPMENT, Cold**  
Deepfreeze Div. Motor Products Corp.

#### SINE BARS

Johansson Div., Ford Motor Co.  
Starrett, L. S., Co.

#### SLEEVES

Cleveland Twist Drill Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Union Twist Drill Co.

#### SLOTTING MACHINES

Baker Brothers, Inc.  
Consolidated Mch. Tool Corp.  
Jones Machine Tool Wks., Inc.  
Rockford Mch. Tool Co.  
Sellers, Wm., & Co., Inc.

#### SOCKETS

Cleveland Twist Drill Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
National Twist Drill & Tool Co.  
Pratt & Whitney Co.  
Scully-Jones & Co.  
Standard Tool Co.  
Union Twist Drill Co.  
Williams, J. H., & Co.

#### SOLDER FOR ALUMINUM AND CAST IRON

Cramp Brass & Iron Foundries Div.

#### SPECIAL MACHINERY and Tools

Aviation Tool & Gauge Co.  
Baird Machine Co.  
Baldwin-Southwark Corp.  
Barnes Drill Co.  
Barnes, W. F. & John, Co.  
Baush Machine Tool Co.  
Bethlehem Steel Co.  
Bilgram Gear & Mch. Wks.  
Birdsboro Steel Fdy. & Mch. Co.  
Blanchard Machine Co.  
Columbus Die, Tool & Machine Co.  
Consolidated Mch. Tool Corp.  
Davis Boring Tool Co., Inc.  
Denison Engineering Co.  
Earle Gear & Mch. Co.  
Elgin Tool Wks., Inc.  
Espan-Lucas Machine Works  
Ex-Cell-O Corp.  
Farrel-Birmingham Co., Inc.  
Gairing Tool Co.  
Gisholt Mch. Co.  
Gorton, George, Mch. Co.  
Grant Mfg. & Mch. Co.  
Greenlee Bros. & Co.  
Hannifin Mfg. Co.  
Hartford Special Mch. Co.  
Hill Acme Co.  
Ingersoll Milling Mch. Co.  
Jefferson Machine Tool Co.  
Jones Machine Tool Wks., Inc.  
Lake Erie Engineering Corp.  
Lemaire Tool & Mfg. Co.  
Lipe-Rollway Corporation

**Modern Machine Corp.**  
Moline Tool Co.  
Morgan Engineering Co.  
Morse Twist Drill & Mch. Co.  
National Acme Co.  
National Tool Co.  
National Twist Drill & Tool Co.  
New Britain-Gridley Mch. Div.,  
New Britain Machine Co.  
New Jersey Gear & Mfg. Co.  
Niagara Mch. & Tool Wks.  
Peck, Stow & Wilcox Co.  
Peerless Machine Co.  
Pollak Mfg. Co.  
Pratt & Whitney Co.  
Reed-Freudrich Co.  
Ruthman Machinery Co.  
S. & S. Mch. Works  
Sundstrand Mch. Tool Co.  
Taft-Peirce Mfg. Co.  
Union Twist Drill Co.  
U. S. Tool Company, Inc.  
V & O Press Co.  
Walshaw Mfg. Wks.  
Wicaco Machine Corp.

**SPEED REDUCERS**  
Atlantic Gear Works, Inc.  
Boston Gear Works, Inc.  
Cleveland Worm & Gear Co.  
Cullman Wheel Co.  
Davis & Thompson Co.  
Farrel-Birmingham Co., Inc.  
Foot Bros. Gear & Machine Corp.  
Ganschow Gear Co.  
General Electric Co.  
Grant Gear Works, Inc.  
James, D. O., Mfg. Co.  
Janette Mfg. Co.  
Master Electric Co.  
Michigan Tool Co.  
Morse Chain Co.  
Philadelphia Gear Works  
Shepard Niles Crane & Hoist Corp.

**SPINDLE STOP**  
Reiger Mfg. Co.

**SPINDLES, Grinding**  
Ex-Cell-O Corporation  
Pope Machinery Corp.

**SPINDLES, Hollow Bored**  
American Hollow Boring Co.

**SPINNING LATHES**  
See Chucking Machines

**SPRING COILING AND FORM-  
ING MACHINERY**  
Baird Machine Co.

**SPRINGS, WIRE**  
Hunter Pressed Steel Co.

**SPROCKET CHAINS**  
Atlantic Gear Works, Inc.  
Boston Gear Works, Inc.  
Cullman Wheel Co.  
Grant Gear Works, Inc.  
Morse Chain Co.  
Philadelphia Gear Works

**SPROCKETS**  
Atlantic Gear Works, Inc.  
Boston Gear Works, Inc.  
Cullman Wheel Co.  
Foot Bros. Gear & Machine Corp.  
Grant Gear Works, Inc.  
Hartford Special Mchry. Co.  
Link-Belt Co.  
Morse Chain Co.  
Philadelphia Gear Works  
Whitney Chain & Mfg. Co.

**STAMPINGS, Sheet Metal**  
Jefferson Machine Tool Co.

**STAMPINGS, Steel**  
Worcester Pressed Steel Co.

**STAMPS, Steel, and Marking Dies**  
Noble & Westbrook Mfg. Co.  
Pittsburgh Stamp Co., Inc.

**STEEL**  
Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Carpenter Steel Co.  
Firth-Sterling Steel Co.  
Frasse, Peter A., & Co., Inc.  
Holliday, W. J., & Co.  
Ingersoll Steel & Disc Div.,  
Borg-Warner Corp.  
National Tube Co., (U. S. Steel  
Corp., Div.).  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.  
Vanadium Alloys Steel Co.  
Wheelock, Lovejoy & Co., Inc.  
Wyckoff Steel Co.

**Gold Drawn**  
Allegheny Ludlum Steel Corp.  
American Steel Co.  
Bethlehem Steel Co.  
Firth-Sterling Steel Co.  
National Tube Co., (U. S. Steel  
Corp., Div.).  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.  
Wheelock, Lovejoy & Co., Inc.  
Wyckoff Steel Co.

**Composite Tool and Die**  
Firth-Sterling Steel Co.

**High Speed Tool**  
Allegheny Ludlum Steel Corp.  
Armstrong Bros. Tool Co.  
Bethlehem Steel Co.  
Carpenter Steel Co.  
Cleveland Twist Drill Co.  
Firth-Sterling Steel Co.  
Latrobe Electric Co.  
Ryerson, Joseph T., & Son, Inc.  
Vanadium Alloys Steel Co.  
Wheelock, Lovejoy & Co.

**Machine**  
Bethlehem Steel Co.  
Holliday, W. J., & Co.  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.  
Vanadium Alloys Steel Co.  
Wheelock, Lovejoy & Co., Inc.

**Rustless**  
Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Carpenter Steel Co.  
Firth-Sterling Steel Co.  
Ingersoll Steel & Disc Div.,  
Borg-Warner Corp.

**Stainless**  
Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Carpenter Steel Co.  
Firth-Sterling Steel Co.  
Frasse, Peter A., & Co., Inc.  
Ingersoll Steel & Disc Div.,  
Borg-Warner Corp.  
National Tube Co., (U. S. Steel  
Corp., Div.).  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.  
Wheelock, Lovejoy & Co., Inc.

**Strip and Sheet**  
Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Frasse, Peter A., & Co., Inc.  
Ryerson, Joseph T., & Son, Inc.  
Zinc, Tin and Copper Coated Strip  
Allegheny Ludlum Steel Corp.

**STEEL ALLOYS**  
See Alloys-steels.

**STEEL BARS**—See Bars, steel.

**STEEL IDENTIFYING MCH.**  
Dravo Corp.

**STEEL STAMPS**  
Sossner Tap & Tool Corp.

**STEEL STOCK GROUND FLAT**  
Brown & Sharpe Mfg. Co.  
Starrett, L. S., Co.

**STELLITE**  
Haynes Stellite Co.

**STOCKS, Die**  
Butterfield Div., Union Twist Drill  
Co.

Card, S. W., Mfg. Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
Oster Manufacturing Co.  
Peerless Machine Co.  
Pratt & Whitney Co.  
Standard Tool Co.

**STONES, Oil or Sharpening**  
Bay State Abrasive Co.  
Carborundum Co.

**STOOLS**  
Standard Pressed Steel Co.

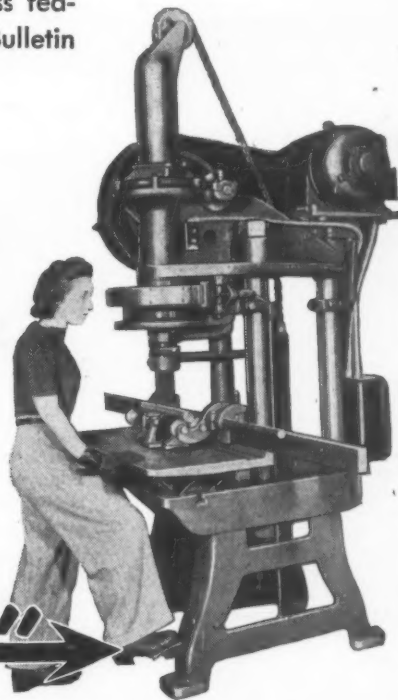
**STRAIGHT EDGES**  
Brown & Sharpe Mfg. Co.  
Johansson Div., Ford Motor Co.  
Jones Machine Tool Wks., Inc.  
Starrett, L. S., Co.

**STRAIGHTENING MACHINERY**  
Baldwin-Southwark Corp.  
Consolidated Mch. Tool Corp.  
General Mfg. Co.  
Hannafin Mfg. Co.  
Lake Erie Engineering Corp.  
Morse Twist Drill & Mch. Co.  
Schatz Mfg. Co.  
Springfield Mch. Tool Co.  
Waterbury Farrel Fury. & Mch. Co.

General Flexible Power Presses have increased production on many straightening operations because of these fundamental advantages: (1) Operator, by stepping on the foot pedal, controls the length of each ram stroke and the amount of pressure applied; (2) Operator has both hands free to handle the work.

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Bardwell & McAllister, Inc.

#### STUD SETTERS

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Modern Tool Wks.  
Procnier Safety Chuck Co.

#### SUB PRESSES

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U. S. Tool Co.  
Waltham Mch. Wks.

#### SUPERFINISHING MACHINES

Norton Co.

#### SURFACE ANALYZERS

Brush Development Co.

#### SURFACE PLATES

See Plates, Surface.

#### SWAGING MACHINES

Cincinnati Shaper Co.  
Etna Machine Co.  
Torrington Co.

#### SWITCHES

Allen-Bradley Co.  
General Electric Co.  
Lincoln Electric Co.  
National Acme Co.  
Shepard Mkes Crane & Hoist Corp.  
Westinghouse Elec. Mfg. Co.

#### TACHOMETERS

Leeds & Northrup Co.  
Scherr, George, Co., Inc.  
Sticht, Herman H., Co., Inc.  
Veeder-Root, Inc.

#### TAPE, Self Sealing

International Plastics Co.

#### TAPER PINS, STANDARD

Morse Twist Drill & Mch. Co.  
Pratt & Whitney Co.

#### TAP EXTENSIONS

Allen Mfg. Co.

#### TAP HOLDERS

Errington Mechanical Laboratory  
Gairing Tool Co.  
McCrosky Tool Corp.  
Procnier Safety Chuck Co.  
Scully-Jones & Co.

#### TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Brown & Sharpe Mfg. Co.  
Buhr Machine Tool Co.  
Errington Mechanical Laboratory  
Etico Tool Co.  
Hoefler Mfg. Co.  
Jarvis, Chas. L., Co.  
Leland-Gifford Co.  
McCrosky Tool Corp.  
Modern Tool Wks.  
Procnier Safety Chuck Co.

#### TAPPING MACHINES

Armstrong-Blum Mfg. Co.  
Avey Drilling Machine Co.  
Baker Brothers, Inc.  
Barnes Drill Co.  
Barnes, W. F., & John, Co.  
Baush Machine Tool Co.  
Bodine Corp.  
Bradford Machine Tool Co.  
Buhr Machine Tool Co.  
Buffalo Forge Co.  
Elgin Tool Wks., Inc.  
Frew Machine Co.  
Geometric Tool Co.  
Greenlee Bros. & Co.  
Haskins, R. G., Co.  
Hill Acme Co.  
Hoefler Mfg. Co.  
Jarvis, Chas. L., Co.  
Kingsbury Mch. Tool Corp.  
Leland-Gifford Co.  
Modern Tool Wks.  
Moline Tool Co.  
Murchey Mch. & Tool Co.  
National Acme Co.  
Procnier Safety Chuck Co.  
Rickert-Shafer Co.  
Warner & Swasey Co.

#### TAPPING MACHINES, Nut

Hill Acme Co.

#### TAPS

Bath, John, & Co., Inc.  
Besly, Chas. H., & Co.  
Butterfield Div., Union Twist Drill Co.  
Card, S. W., Mfg. Co.  
Detroit Tap & Tool Co.  
Geometric Tool Co.  
Greenfield Tap & Die Corp.  
Hanson-Whitney Mch. Co.  
Landis Mch. Co.  
Morse Twist Drill & Mch. Co.  
Murchey Mch. & Tool Co.  
National Acme Co.  
Pratt & Whitney Co.  
Sossner Tap & Tool Corp.  
Standard Tool Co.  
Threadwell Tap & Die Co.  
Vard, Inc.  
Wood & Spencer Co.  
Woodworth, N. A., Co.

#### Collapsing

Geometric Tool Co.  
Landis Mch. Co., Inc.  
Modern Tool Wks.  
Murchey Mch. & Tool Co.  
National Acme Co.  
Rickert-Shafer Co.

#### TESTING EQUIPMENT, Tension Compression, Fatigue, Etc.

Olsen, Tinius, Testing Machine Co.

#### THERMOMETER, Indicating and Recording

Leeds & Northrup Co.

#### THREAD CUTTING MCHRY.

Brown & Sharpe Mfg. Co.  
Eastern Machine Screw Corp.  
Fellows Gear Shaper Co.  
Geometric Tool Co.  
Grant Mfg. & Mch. Co.  
Hill Acme Co.  
Landis Mch. Co., Inc.  
Lees-Bradner Co.  
Modern Tool Works  
Murchey Mch. & Tool Co.  
Oster Manufacturing Co.  
Peerless Machine Co.  
Pratt & Whitney Co.  
Rickert-Shafer Co.  
Rivett Lathe & Grinder, Inc.  
Rogers Machine Works, Inc.  
Taft-Peirce Mfg. Co.

#### THREAD CUTTING TOOLS

Armstrong Bros. Tool Co.  
Eastern Machine Screw Corp.  
Geometric Tool Co.  
Hill Acme Co.  
Landis Mch. Co., Inc.  
Modern Tool Works  
Oster Manufacturing Co.  
Peerless Machine Co.  
Pratt & Whitney Co.  
Ready Tool Co.  
Rickert-Shafer Co.  
Rivett Lathe & Grinder, Inc.  
Taft-Peirce Mfg. Co.  
U. S. Machine Tool Mfg. Corp.  
Vard, Inc.  
Williams, J. H., & Co.

#### THREAD GAGES

See Gages, Thread.

#### THREAD GRINDING MCHS.

See Grinding Machines, Thread.

#### THREAD MILLING MACHINES

Coulter, James, Machine Co.  
Hanson-Whitney Mch. Co.  
Lees-Bradner Co.  
Plan-O-Mill Corp.  
Pratt & Whitney Co.  
Waltham Mch. Wks.

#### THREAD ROLLING MACHINES

Hill Acme Co.  
Peck, Stow & Wilcox Co.  
Rolled Thread Die Co.  
V & O Press Co.

#### TIN AND TERNE PLATES

Bethlehem Steel Co.

#### TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp.  
Armstrong Bros. Tool Co.  
Barber-Colman Co.  
Black Drill Co.  
Carpenter Steel Co.  
Firth-Sterling Steel Co.  
Illinois Tool Wks.  
Ryerson, Joseph T., & Son, Inc.  
Vanadium Alloys Steel Co.  
Wheelock, Lovejoy & Co., Inc.  
Williams, J. H., & Co.

#### Special Alloy

Allegheny Ludlum Steel Corp.  
Firth-Sterling Steel Co.  
Haynes Stellite Co.

#### TOOL GRINDERS

See Grinders for Sharpening Turning and Planing Tools.

#### TOOL HEADS, Adjustable

Gairing Tool Co.

#### TOOLHOLDERS

Armstrong Brothers Tool Co.  
Cleveland Twist Drill Co.  
Enco Mfg. Co. (turret)  
Gairing Tool Co.  
Gisholt Machine Co.  
Jones & Lamson Mch. Co.  
Lovejoy Tool Co., Inc.  
Michigan Tool Co.  
O.K. Tool Co., Inc.  
R and L Tools  
Ready Tool Co.  
Scully-Jones & Co. (turret)  
Warner & Swasey Co.  
Wesson Co.  
Williams, J. H., & Co.

#### TOOLMAKERS' INSTRUMENTS

Brown & Sharpe Mfg. Co.  
Scherr, George, Co., Inc.  
Starrett, L. S., Co.  
Vard, Inc.

#### TOOL STEEL

Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Carpenter Steel Co.  
Firth-Sterling Steel Co.  
Ryerson, Joseph T., & Son, Inc.

#### TOOLS, Carbide-Tipped

Allegheny Ludlum Steel Corp.  
Carboloy Co., Inc.  
Ex-Cell-O Corporation  
Firth-Sterling Steel Co.  
Gairing Tool Co.

Illinois Tool Wks.  
Kennametal, Inc.  
Lincoln Park Industries, Inc.  
Metal Carbides Corp.  
Michigan Tool Co.  
Morse Twist Drill & Mch. Co.  
Super Tool Co.  
Vanadium Alloys Steel Co.

#### Lathe, Shaper and Planer

Armstrong Brothers Tool Co.  
Firth-Sterling Steel Co.  
Gisholt Machine Co.  
(For Lathes Only)  
Haynes Stellite Co.  
Illinois Tool Wks.  
Jones & Lamson Mch. Co.  
Kennametal, Inc.  
Michigan Tool Co.  
O.K. Tool Co., Inc.  
Ready Tool Co.  
Super Tool Co.  
Warner & Swasey Co.  
Williams, J. H., & Co.

#### TRANSFORMERS

General Electric Co.  
Wagner Electric Co.

#### TRANSMISSION MACHINERY

See Hangers, Shafting, Pulleys, Clutches, Couplings, Belting, Chains, etc.

#### TRANSMISSION, Variable Speed

Continental Machines, Inc.  
Reeves Pulley Co.

#### TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co.  
Williams-White & Co.

#### TUBING, Brass and Copper

American Brass Co.

#### Flexible

Chicago Metal Hose Corp.  
Titeflex, Inc.

#### Stainless Steel

Allegheny Ludlum Steel Corp.  
Carpenter Steel Co.  
Chicago Metal Hose Corp.  
National Tube Co. (U. S. Steel Corp. Div.)  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.

#### Steel and Seamless Steel

Allegheny Ludlum Steel Corp.  
Bethlehem Steel Co.  
Frasse, Peter A., & Co., Inc.  
National Tube Co. (U. S. Steel Corp. Div.)  
Ryerson, Joseph T., & Son, Inc.  
Timken Roller Bearing Co.

#### TUMBLING BARRELS

Baird Machine Co.

#### TUNGSTEN CARBIDE

Allegheny Ludlum Steel Corp.  
Carboloy Co., Inc.  
Firth-Sterling Steel Co.  
Kennametal, Inc.  
Metal Carbides Corp.  
Super Tool Co.

#### TWIST DRILLS

See Drills, Twist.

#### UNIVERSAL JOINTS

Baush Machine Tool Co.  
Boston Gear Works, Inc.

#### V-BELTS

Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.  
Manheim Mfg. & Belting Co.  
Worthington Pump & Mchry. Corp.

#### VALVES AND FITTINGS

Weatherhead Co.

#### VALVES

##### Hydraulic

Baldwin-Southwark Corp.  
Barnes, John S., Corp.  
Galland-Henning Mfg. Co.  
Hannifin Mfg. Co.  
Hydraulic Products Co.  
Logansport Machine, Inc.  
Peerless Machine Co.  
Sundstrand Mch. Tool Co.  
Vard, Inc.  
Watson-Stillman Co.

##### Pneumatic

Anker-Holth Mfg. Co.  
Hanna Engineering Works  
Hannifin Mfg. Co.

#### VISES

##### Bench

Avey Drilling Machine Co.  
Desmond-Stephan Mfg. Co.  
Penn Mfg. Co.  
Jefferson Machine Tool Co.

#### Machine

Armstrong-Blum Mfg. Co.  
Armstrong Brothers Tool Co.  
Avey Drilling Machine Co.  
Barber-Colman Co.  
Brown & Sharpe Mfg. Co.  
Desmond-Stephan Mfg. Co.  
Graham Mfg. Co., Inc.  
Hannifin Mfg. Co.  
Jefferson Machine Tool Co.  
LeBlond, R. K., Mch. Tool Co.  
Logansport Machine, Inc.  
Sheldon Mch. Co.

#### Pipe

Greenfield Tap & Die Corp.  
Williams, J. H., & Co.

#### Planer and Shaper

Brown & Sharpe Mfg. Co.  
Cincinnati Planer Co.  
Cincinnati Shaper Co.  
Graham Mfg. Co., Inc.  
Hendey Machine Co.  
Rockford Machine Tool Co.

#### VIBRATION INSULATORS

General Tire & Rubber Co.

#### VOLTMETERS

General Electric Co.

#### WASHERS, Lock

Manufacturers Screw Products  
National Lock Washer Co.

#### Spring

National Lock Washer Co.

#### WASHING MACHINES

Tolhurst Centrifugal Div., American Machine & Metals, Inc.

#### WELDING AND CUTTING EQUIPMENT, Oxyacetylene

Air Reduction Sales Co.  
Linde Air Products Co.

#### WELDING AND CUTTING GASES

Air Reduction Sales Co.  
Linde Air Products Co.

#### WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co.  
General Electric Co.  
Lee, K. O., & Son Co.  
Lincoln Electric Co.  
Master Electric Co.  
Westinghouse Electric & Mfg. Co.

#### WELDING POSITIONER

Cullen-Friedstedt Co.  
Ransome Machinery Co.

#### WHITE PRINTS, Paper & Machine

Ozalid Products Div., General Aniline & Film Corp.

#### WIRE

Bethlehem Steel Co.

#### WIRE FORMING MACHINERY

Baird Machine Co.  
U. S. Tool Co., Inc.

#### WIRE NAIL MACHINERY

Ryerson, Joseph T., & Son, Inc.

#### WOODWORKING MACHINERY

Jefferson Machine Tool Co.  
Onsrud Machine Works, Inc.  
Sidney Machine Tool Co.  
Walker-Turner Co., Inc.

#### WORM DRIVES

Cleveland Worm & Gear Co.  
Michigan Tool Co.  
Philadelphia Gear Works

#### WRENCHES

Armstrong Brothers Tool Co.  
Standard Tool Co.  
Williams, J. H., & Co.

#### Detachable Socket

Williams, J. H., & Co.

#### Pipe

Greenfield Tap & Die Corp.

#### Ratchet

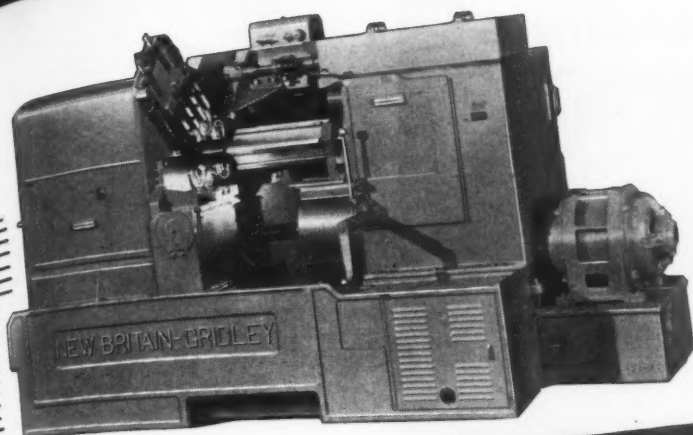
Williams, J. H., & Co.

#### Tap

Besly, Chas. H., & Co.  
Butterfield Div., Union Twist Drill Co.  
Card, S. W., Mfg. Co.  
Greenfield Tap & Die Corp.  
Morse Twist Drill & Mch. Co.  
Pratt & Whitney Co.  
Standard Tool Co.

#### Torque Measuring

Sturtevant, P. A., Co.  
Williams, J. H., & Co.



**The more the work,  
the greater the need  
for NEW BRITAINS**

● New Britain multiple spindle automatic screw machines and chucking machines were developed to meet the needs of manufacturers who must have *production*. They are unsurpassed in their accuracy and adaptability, and unequalled for ability to turn out more per hour and *keep doing it*.

**NEW BRITAIN-GRIDLEY MACHINE DIVISION  
THE NEW BRITAIN MACHINE COMPANY  
NEW BRITAIN, CONNECTICUT**

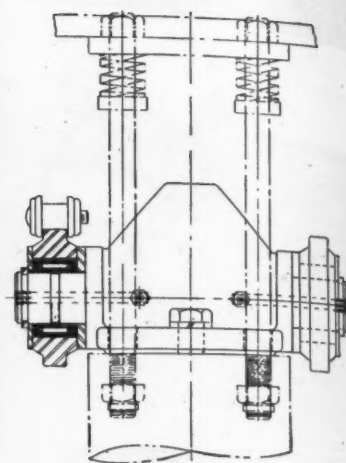
**NEW BRITAIN  
AUTOMATICS**

**GET MORE DONE IN WAR AND PEACE**

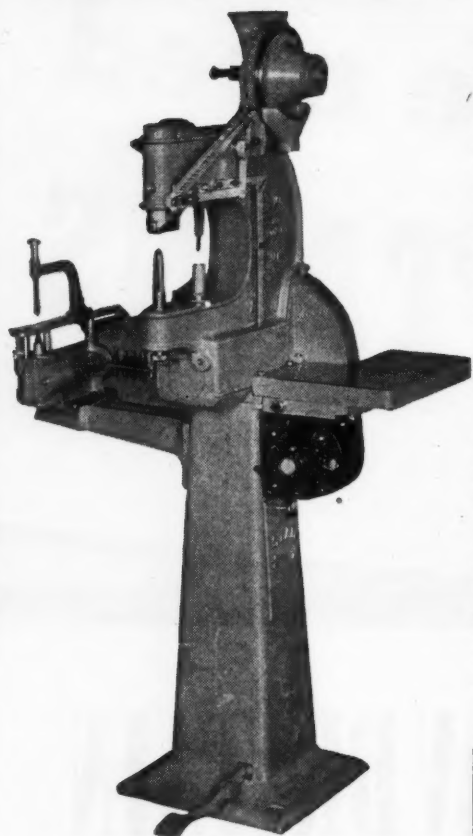


# IN THE NEWS

## WITH TORRINGTON BEARINGS

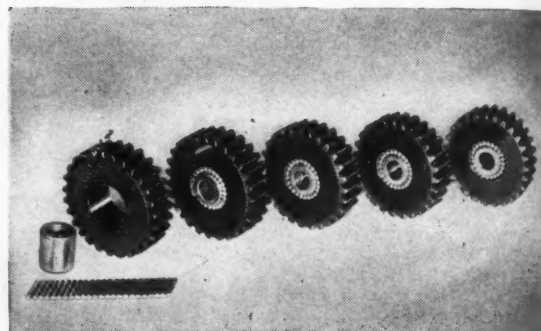


**LIFT TRUCKS**, manufactured by the Towmotor Corporation, are designed for the safe, rapid handling of multi-ton loads in around-the-clock service. To provide smooth operation in raising and lowering the load, Torrington NCS Needle Bearings are used on the hydraulic lifting cylinder crosshead. X-section clearly shows how compactness and high capacity of these bearings make them especially suitable for this interesting application.

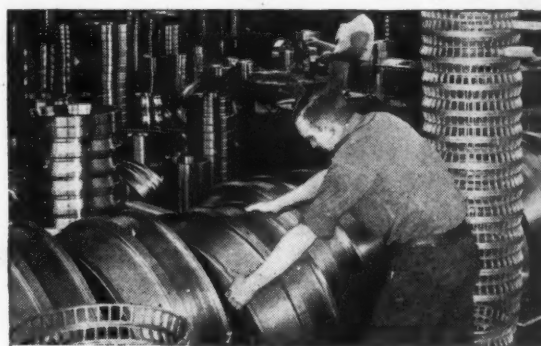


**DELINING & RELINING** of brakes is done rapidly and efficiently in a series of automatic operations performed by this brakere lining machine manufactured by the Star Machine & Tool Company. Front and rear plungers, which perform the delining and riveting operations, operate at nearly 300 R.P.M. To reduce friction to a minimum, special Torrington Roller Bearings are used for the plunger rollers.

**MORE THAN 150,000** Jahco airplane starters have been manufactured by the "associates" of Jack & Heintz, Inc. Noted for their dependability and instant response to the starter switch, Jahco starters are now used exclusively in all large combat and bombing aircraft. Due to the necessity for compact design and light weight, Torrington LN Needle Bearings were selected for use in the gears shown at the right.



**"OUT OF THE ORDINARY"** bearing applications are an important phase of Torrington's Engineering Service. The specifications may call for a bearing of unusual size, or special design. Frequently a bearing previously engineered for one application can be adapted to meet the requirements of another. Man in foreground in photo at right is handling the inner race of a large double-row tapered roller bearing, a type widely used in heavy-duty mill applications.





# TORRINGTON BEARINGS

**STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL**

**THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION**

**SOUTH BEND 21, INDIANA**



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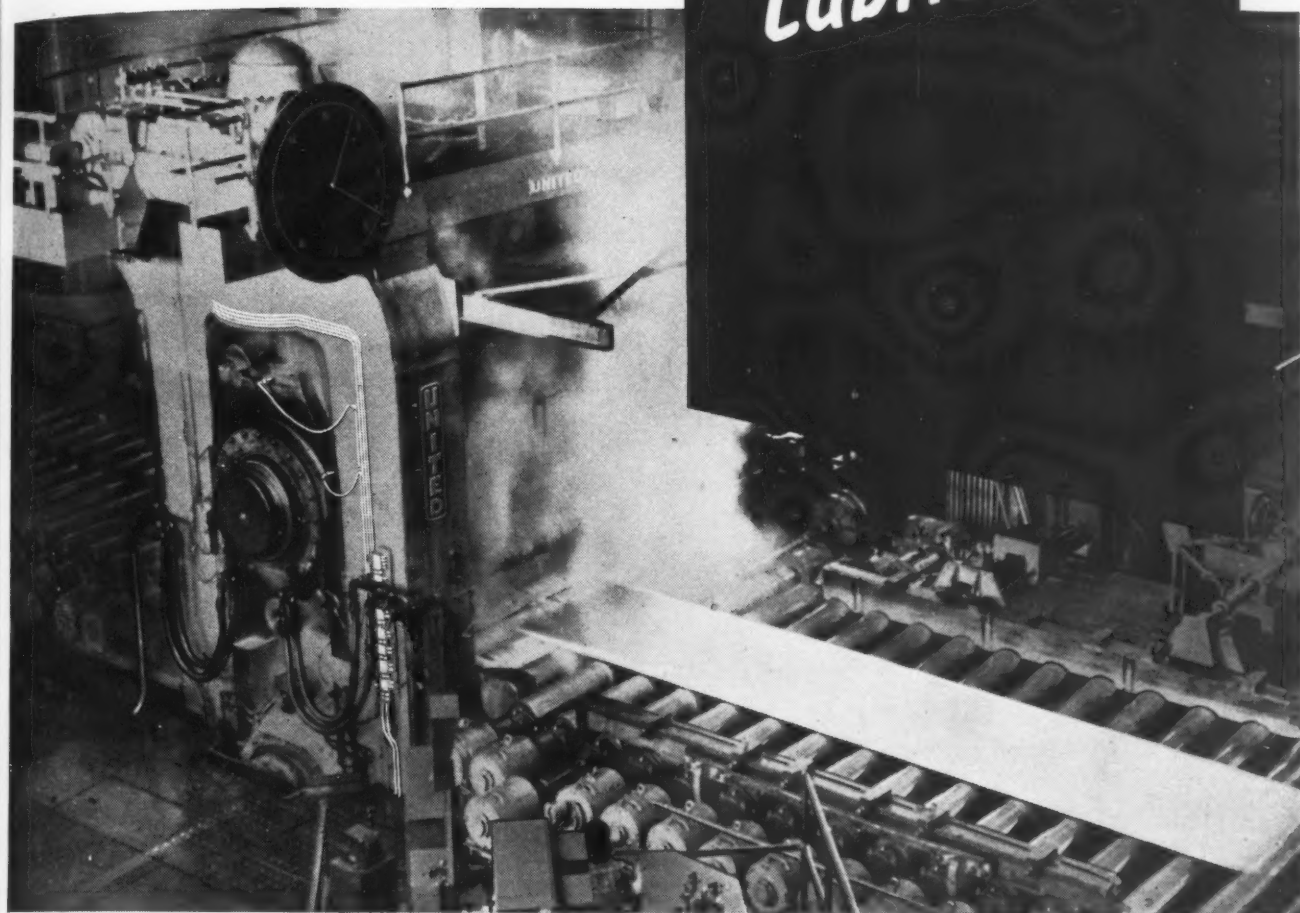
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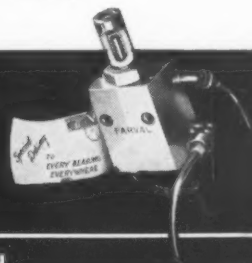
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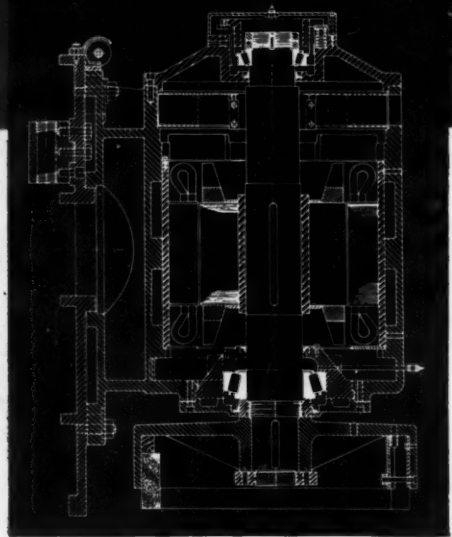
MACHINERY, March, 1944



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